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MANAGEMENT INFORMATION SYSTEMS

MODULE 3

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CHAPTER 1

INTRODUCTION TO MANAGEMENT INFORMATION SYSTEMS

1.1 What is a management information system (MIS)?

Introduction

In this unit we are going to discuss the meaning and some important aspects of management information system. According to the Systems Approach of Management, an organization is a sum of the interrelated parts or sub systems. The management is responsible to make relations amongst these Sub-Systems into a total system. For this purpose Management Information System (MIS) becomes an unavoidable part of any organization. Management Information System is a systematized cyclic pattern of communication. By this System, organizations cannot achieve their goals.

System

This is an organized grouping of components having certain interrelationships and working collectively to achieve a set of objectives. The system approach is a method or framework which helps us to analyze and explore the operations and interactions which exist in the systems around us.

Any given system possesses the follow **characteristics** or attributes:-

1. Organization – This is the arrangement of components that help to achieve objectives.
2. Central objective – Among the interacting components there has to be goals or objectives focused by all.
3. Interaction – This is the manner in which each component functions with other components of the system.
4. Interdependence – This means that parts of the organization or system depend on one another.
5. Integration – This is concerned with how a system is tied together.

Elements of a System

1. INPUT – These are components that are required to be processed so as to give the output. This includes raw materials, energy and human labor.
2. OUTPUT – This is the product of processing e.g. goods or a service.
3. PROCESSING – This is the transformation or conversion procedure of input into output. i.e. production department or factory.
4. CONTROL – this element guides the system. In an organization this is the decision making body that controls the pattern of activities, governs input, processing and output e.g the management of a company.

5. FEEDBACK – Control in a dynamic system is achieved by feedback which is the measure of output against the standard.
6. ENVIRONMENT – This is the source of external elements that interact with the system or exert pressure e.g. customers, suppliers, government policies and competition.
7. BOUNDARY – This are the limits that identity its components, processes and interrelationships when it interfaces with another system e.g. in a company the invoicing function could be undertaken by the sales department whereas in another it's undertaken by the Account department.

Meaning of MIS

MIS consists of three words, that is Management, Information and System. On the basis of these three words MIS can be defined as a system, which supplies information to Management. Actually, MIS is a process of providing necessary information to management. It helps in planning, controlling and in taking different managerial decisions. MIS is the structured, formal, systematic part of communication system. MIS is an assemblage of personnel and facilities, organized into an integrated system by which relevant, adequate and timely information is supplied to the executives.

It is to be mentioned that in respect of a large enterprise, MIS can be built around electronic computers. MIS is not new, but only its computerization is new. Before the invention of computer, MIS techniques had existed to supply operations. The computer has added one or more dimensions such as speed, accuracy and increased volume of data.

Some definitions of MIS are given below

According to Kennevans, MIS is an organised method of providing past, present and projection information relating to internal operations and external intelligence.

According to Gordon B. Davis, MIS is an integrated man/machine system for providing information to support the operations management and decision making functions of an organization.

According to Robert G. Mardick, goel E Ross and gomes R.Claggett, MIS is the System intended to provide information for decision making, planning, organizing and controlling the operations of the subsystems of the firm and to provide a Synergistic organization in the process.

Definition of MIS

Any telecommunications and/or computer related equipment or interconnected system or sub-systems of equipment that is used in the acquisition, storage, manipulation, management, movement, control, display, switching, interchange, transmission or reception of voice and/or data, and includes software, firmware and hardware.

Also, a MIS is an IS that provides information to the management to enable them plan, coordinate, control monitor and make decision by providing routine, summarizes and exceptional report.

The focus is on the design and operation of the MIS which means that the information system is viewed as a means of processing data, i.e. the routine facts and figures of the organization, into information which is then used for decision making. It is changes in decision behavior which distinguish data from information.

The Figure 1.1 summarizes this approach.

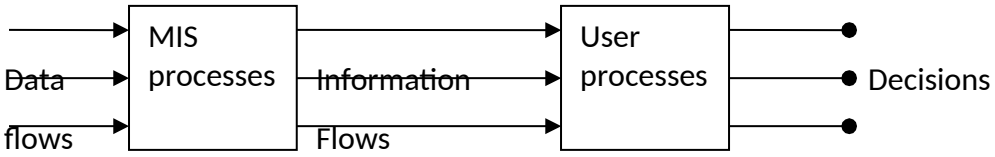


Figure 1.1

This means that MISs are qualitatively different from data processing systems and that management involvement and interaction between information specialists and management are the key features of successful MIS design.

Therefore, MIS can be defined as:

A system to convert data from internal and external sources into information and to communicate that information, in an appropriate form, to managers at all levels in all functions to enable them to make timely and effective decisions for planning, directing and controlling the activities for which they are responsible.

To be successful an MIS must be designed and operated with due regard to **organization** and **behavioral** principles as well as **technical** factors. Management must be informed enough to make an effective contribution to systems design and information specialists (systems analysts, accountants, operations researchers and others) must become more aware of managerial functions and needs so that, jointly, more effective MISs are developed.

Characteristics of MIS

The management information system has the following characteristics

1) System approach: MIS is based on the System approach. It is a step by step approach to the study of system and its performance. Performance is made in the light of the objective which has been constituted for that purpose.

2) Management oriented: Under MIS, necessary information is provided to each manager at the right time, in right form and a relevant one, which is required by the management by providing information in taking effective managerial decision.

3) Future oriented: MIS is designed and developed keeping in view the future position of the business. Therefore, MIS should provide useful information on the basis of projections based on which future action can be taken.

4) Integrated: MIS is designed in taking a comprehensive view or looking at the complete picture of the interlocking sub-systems that operate within the company. It considers all aspects of production, marketing, accounting, financing, management etc.

5) Common-data followed: MIS deals with the common data that are available in the business. MIS provides data and information for taking effective managerial decision, which must select the real picture of the business.

6) Long term planning: MIS is prepared for long term planning of the business. So, the designer should avoid the outdated data and information in designing and developing time of MIS. The designer should consider the present situation and future trend of the business activities, when MIS is designed.

7) Control database: Another important characteristic of MIS is that it always based on centralized data and information. It is because of this fact that MIS is to supply data and information in such a way so that the management can take its important decision.

Functions of MIS

The main purpose of MIS is to provide the management with the necessary information for decision making. In order to achieve this purpose MIS is to perform the following functions.

1) Collection of data: The first function of MIS is to collect necessary data from both internal and external sources of the organization. The data of the organization which have already been gathered are kept in some physical medium such as a paper form or entering it directly into computer system.

2) Processing data: After storing the data, the next important function of MIS is to process the same. In the processing, the data are converted to require management information, calculating company, sorting, classifying and summarizing etc. are the necessary activities to be done for processing the data.

3) Storage of information: Under the MIS, necessary data and information are carefully stored, so that it can save time for searching the same. Generally, data and information are stored by reserving and organizing them in the form of files, records and databases for future use

4) Retrieval of information: Another function of MIS is to retrieve the information to meet the exact management information demands. So retrieval should be done as per the requirement of the management users.

5) Disseminating: Disseminating is the last function or finished product of MIS. By disseminating the data and information are divided and distributed to the users in an organization. This can be done through reports or outline through computer terminals periodically.

Components of MIS and their relationship

A management information system is made up of five major components namely people, business processes, data, hardware, and software. All of these components must work together to achieve business objects.

People – these are the users who use the information system to record the day to day business transactions. The users are usually qualified professionals such as accountants, human resource managers, etc. The ICT department usually has the support staff who ensure that the system is running properly.

Business Procedures – these are agreed upon best practices that guide the users and all other components on how to work efficiently. Business procedures are developed by the people i.e. users, consultants, etc.

Data – the recorded day to day business transactions. For a bank, data is collected from activities such as deposits, withdrawals, etc.

Hardware – hardware is made up of the computers, printers, networking devices, etc. The hardware provides the computing power for processing data. It also provides networking and printing capabilities. The hardware speeds up the processing of data into information.

Software – these are programs that run on the hardware. The software is broken down into two major categories namely system software and applications software. System software refers to the operating system i.e. Windows, Mac OS, and Ubuntu, etc. Applications software refers to specialized software for accomplishing business tasks such as a Payroll program, banking system, point of sale system, etc.

Role of Information in an Organization

In addition to the general function of improving knowledge, information assists management in several ways including:

- The reduction of uncertainty: uncertainty exists where there is less than perfect knowledge. Rarely, if ever, is there perfect knowledge but relevant information helps to reduce the unknown. This is particularly relevant in planning and decision making.
- As an aid to monitoring and control: by providing information about performance and the extent of deviations from planned levels of performance, management is better able to control operation.

- As a means of communication: managers need to know about developments, plans, forecasts, and impending changes and so on.
- As a memory supplement: by having historical information about performance, transactions, results of past actions and decisions available for reference, personal memories are supplemented.
- As an aid to simplification: by reducing uncertainty and enhancing understanding, problems and situations are simplified and become more manageable.

Characteristics of good Management Information System

- The purpose of a management information system is to help executives of an organization make decisions that advance the organization's goals. An effective MIS assembles data available from company operations, external inputs and past activities into information that shows what the company has achieved in key areas of interest, and what is required for further progress. The most important characteristics of an MIS are those that give decision-makers confidence that their actions will have the desired consequences.

Relevance

- The information a manager receives from an MIS has to relate to the decisions the manager has to make. An effective MIS takes data that originates in the areas of activity that concern the manager at any given time, and organizes it into forms that are meaningful for making decisions. If a manager has to make pricing decisions, for example, an MIS may take sales data from the past five years, and display sales volume and profit projections for various pricing scenarios.

Accuracy

- A key measure of the effectiveness of an MIS is the accuracy and reliability of its information. The accuracy of the data it uses and the calculations it applies determine the effectiveness of the resulting information. The sources of the data determine whether the information is reliable. Historical performance is often part of the input for an MIS, and also serves as a good measure of the accuracy and reliability of its output.

Usefulness

- The information a manager receives from an MIS may be relevant and accurate, but it is only useful if it helps him with the particular decisions he has to make. For example, if a manager has to make decisions on which employees to cut due to staff reductions, information on resulting cost savings is relevant, but information on the performance of the employees in question is more useful. The MIS has to make useful information easily accessible.

Timeliness

- MIS output must be current. Management has to make decisions about the future of the organization based on data from the present, even when evaluating trends. The more recent the data, the more these decisions will reflect present reality and correctly anticipate their effects on the company. When the collection and processing of data delays its availability, the MIS must take into consideration its potential inaccuracies due to age and present the resulting information accordingly, with possible ranges of error.

Completeness

- An effective MIS presents all the most relevant and useful information for a particular decision. If some information is not available due to missing data, it highlights the gaps and either displays possible scenarios or presents possible consequences resulting from the missing data. Management can either add the missing data or make the appropriate decisions aware of the missing information. An incomplete or partial presentation of information can lead to decisions that don't have the anticipated effects.

Approaches to system classification

There are two broad categories.

a). The pre-specific processing of day to day transactions ,known as data processing or transaction processing and the production of regular reports analysis and information for planning control and decision making directly by the computer.

b). the use of computers by the end –users themselves .They include managers, accountants, office staff, sales people executive etc.

Both produce management information. The key difference is that the pre specified systems supply pre- determined outputs and reports so there is less flexibility.

This means that great care must be taken in analyzing and determining management's real information .On the other hand, with the end user computing there is more flexibility and interaction so that the emphasis becomes one of supporting the end user rather than the production of a specified report.

Information systems can be classified by:

(a) Organizational level Supported

That is, information systems that support managers at different levels of the organization. This classifies IS as transaction processing systems (TPS, to support operational level), management information systems (MIS, to support middle/tactical level), and Executive information system (EIS, to support the senior level management).

(a) Functional area supported

These are information systems that support operations and management of different functions within an organization. They include: financial management systems, human resource management systems, marketing management systems etc.

(c) Support provided.

They are classified according to the support they provide. They include:

- Data processing systems/transaction processing systems
- Management information systems
- Executive information systems

(d) Management activity supported

Executive support systems (ESS)

They are designed to help senior management make strategic decisions. An ESS gathers analyses and summarizes the key internal and external information used in the business. ESS typically involves lots of data analysis and modeling tools, such as "what-if" analysis, to help strategic decision-making.

A good way to think about an ESS is to imagine the senior management team in an aircraft cockpit, with the instrument panel showing them the status of all the key business activities.

Management information systems (MIS)

They are primarily concerned with internal sources of information. MIS usually take data from the transaction processing systems (see below) and summarize it into a series of management reports.

MIS reports tend to be used by middle management and operational supervisors.

Decision support systems (DSS)

Specifically designed to help management make decisions in situations where there is uncertainty about the outcomes of those decisions.

DSS use tools and techniques to help gather relevant information and analyze the options and alternatives. DSS often involves use of complex spreadsheet and databases to create "what-if" models.

Knowledge management systems (KMS)

Exist to help businesses create and share information. They are typically used in businesses where employees create new knowledge and expertise, which can then be shared by other people in the organization to create further commercial opportunities. Good examples include firms of lawyers, accountants and management consultants.

KMS are built around systems which allow efficient categorization and distribution of knowledge. For example, the knowledge itself might be contained in word processing documents, spreadsheets, PowerPoint presentations. Internet pages etc. To share the knowledge, a KMS would use group collaboration systems, such as an intranet.

Transaction processing systems (TPS)

They are designed to process routine transactions efficiently and accurately.

A business will have several TPS; for example:

- Billing systems to send invoices to customers
- Systems to calculate the weekly and monthly payroll and tax payments
- Production and purchasing systems to calculate raw material requirements
- Stock control systems to process all movements into, within and out of the business

Office automation systems

Try to improve the productivity of employees who need to process data and information.

Perhaps the best example is the wide range of software systems that exist to improve the productivity of employees working in an office (for example, Microsoft Office XP), or systems that allow employees to work from home or while on the move**.**

Decision support systems - expert systems

APPROACHES TO INFORMATION SYSTEMS

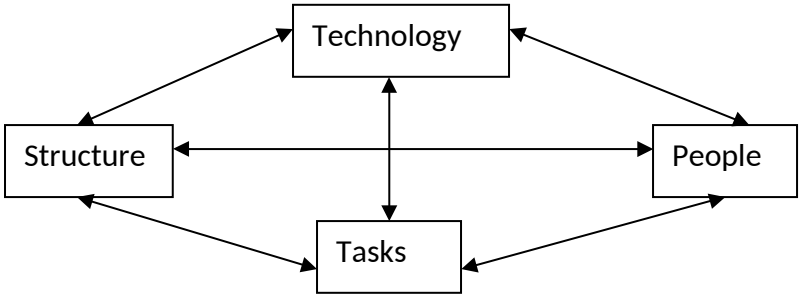
Social-technical Systems

The socio-technical view of organizations was developed by Trist and the Tavistock Institute and arose from consideration that any production system requires both a technological organization, i.e. the equipment, processes, methods, etc. and a work organization relating to those who carry out the necessary tasks to each other, i.e. the social system. Based on this view an organization is not just a technical or social system but is the structuring of human activities round various technologies.

The technologies involved determine the technical sub-systems and vary widely. Consider, for example, the differing skills, procedures, machinery, equipment and the layout of facilities required in an electronics company, a car manufacturer, a hospital or a computer bureau.

In addition to the technical sub-system, every organization has a social subsystem which consists of the aspirations, expectations, interactions and value systems of the members. The two sub-systems - the technical and the social -cannot be looked at separately but must both be considered as interrelating within the

organization. Socio-technical theory suggests that the organization consists of four interrelated elements - tasks, people, structure and technology as shown in Figure below:



More traditional approaches to Organizations and their problems have tended to concentrate on one or other of the sub-systems with little or no recognition of the other.

Social-Technical View of IS

Contemporary Approaches to Information Systems

The study of information systems deals with issues and insights contributed from technical and behavioral disciplines.

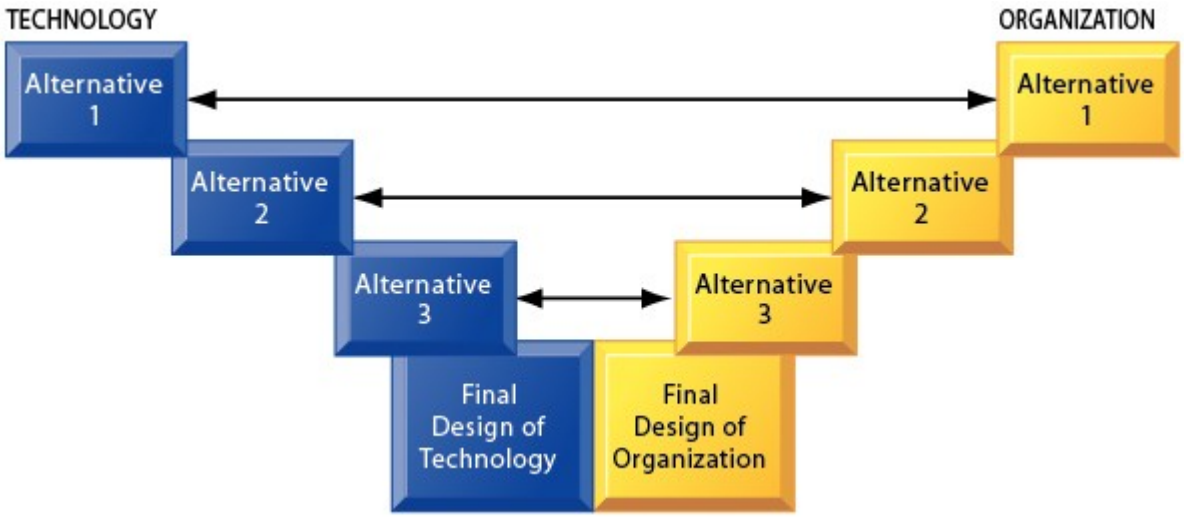
The technical approach emphasizes mathematically based, normative models to study information systems, as well as the physical technology and formal capabilities of these systems. The behavioral approach, a growing part of the information systems field, does not ignore technology, but tends to focus on non-technical solutions concentrating instead on changes in attitudes, management and organizational policy, and behavior.

MIS combines the work of computer science, management science, and operations research with a practical

orientation toward developing system solutions to real-world problems and managing information technology resources. It is also concerned with **behavioral issues** surrounding the development, use, and impact of information systems, which are typically discussed in the fields of sociology, economics, and psychology

In the sociotechnical view of systems, optimal organizational performance is achieved by jointly optimizing both the social and technical systems used in production. Adopting a sociotechnical systems perspective helps to avoid a purely technological approach to information systems.

Technology must be changed and designed, sometimes even "de-optimized," to fit organizational and individual needs. Organizations and individuals must also be changed through training, learning, and planned organizational change to allow technology to operate and prosper.
Information systems are sociotechnical systems. Although they are composed of machines, devices, and "hard" physical technology, they require substantial social, organizational, and intellectual investments to make them work properly. Since problems with information systems—and their solutions—are rarely all technical or behavioral, a multidisciplinary approach is needed.
A Sociotechnical Perspective on Information Systems



In a sociotechnical perspective, the performance of a system is optimized when both the technology and the organization mutually adjust to one another until a satisfactory fit is obtained.

System Approach or System Theory

The systems approach is a method or framework which helps us to analyze and explore the operation and interactions which exist in the systems around us. In other words; this is an approach to problem solving e.g. trying to structure an organization or analyze an information system. It involves trying to establish the objectives of the system through considering the relationship with its environment, identifying its component and the interaction features of the system.

Systems And Adaptability

To be successful and to remain in existence, organizations must be flexible and adapt to change. This means change not only in the Organization's relationship with the external environment but also in its internal methods and structures. Successful Organizations are characterized by their internal openness and their readiness to accept that yesterday's methods and products are very unlikely to be suitable for tomorrow. Recognizing the need for change, initiating change and managing change successfully are the hallmarks of good quality management. Organizations do not automatically adjust to change.

Adaptation only occurs as a result of management decisions and action. Successful change is change that is planned and considered. This means that the effects on the Organization as a whole must be considered when making a change to part of the Organization. It will be recalled that a key element of the systems approach is that changes in parts of a system affect the system as a whole. Thus, to make successful changes one must be aware of the interactions which exist in the Organization.

Systems theory recognizes that open systems can achieve their objectives in a variety of ways using varying inputs, processes and methods. This is known as equifinality.

Features of the systems approach;

a) Holism or synergy- All systems are composed of interrelated parts or sub-systems and the system can only be explained as a whole (Holism or synergy). This is known as holism or synergy. Holism states that any whole is more than the sum of its individual parts. When the appropriate parts are combined, properties appear from the whole which the parts alone do not possess. These are known as emergent properties. Examples of emergent properties are:

- Taste: a property of water not the constituent hydrogen and oxygen atoms.
- Growth: a property arising from the combination of seeds and soil.
- Obsolescence (Uselessness): likely to arise from consideration of financial, technical and personnel factors. A machine may still work but may be too expensive or dangerous to run or may no longer be required for current production.

b) Systems are hierarchical in that the parts of sub-systems are made up of other smaller parts. For example, the accounting systems of an organization may be a sub-system of the information system which is itself a sub-system of the planning system, which is a sub-system of the organization as a whole. Progressing down the hierarchy increases the detail but reduces the area whilst moving upwards provides a successively broader view.

c) The parts of a system cannot be altered without affecting other parts. Many organizational problems stem from ignoring this principle. For example, a departmental procedure or form might be changed without considering the ripple effects on the other departments affected, with dire consequences.

d) The sub-systems should work towards the goal of their higher systems and not pursue their own objectives independently. If sub-systems pursue their own objectives to the determent of higher objectives (organization), this condition is known as sub-optimally i.e. they aren't performing optimally.

e) Organizational systems contain both hard and soft properties. Hard properties are those that can be assessed in some objective way. Examples are; the number of components in a storage bin, the amount of PAYE tax a person will pay. The soft aspects of a system are a matter of individual values or taste. They cannot be assessed by any objective standard or measuring process. Examples are: the appearance of a product, the suitability of a person for a job, any problem containing a political element and so on.

Entropy

Entropy is the term for the disorder or chaos in a system. Totally closed systems naturally deteriorate and the total entropy in a system, without inputs, always increases.

Entropy can be countered by bringing in information and other stimuli from the system's environment. This helps the system to adapt and lower its entropy. Such a process is known as introducing negative entropy.

Interconnections

Each sub-system has many inputs and outputs resulting in several interconnections within the same system. Such interconnection of interfaces increases the cohesion between them. It thus increases the complexity of making it difficult to manage, co-ordinate and modify e..g

Changing the system that products customer details may affect other sub-system in the sales ledger module.

A system with 4 sub-systems will have 6 possible interconnections in the formula $\frac{n(n-1)}{2}$ where n is the number of sub-systems.

General formula to give number of interconnections where n is the number of sub-system is given by $\frac{N(N-1)}{2}$

Decoupling:

This is the tight connection between sub-components e.g. resources and facilities need to be finely balanced, parts and documentation must be available and there must be good flow of information. The solution is to decouple or looser or reduce the intensity of interactions so that the sub-systems can operate with a degree of independence.

Decoupling can be done in the following three ways:-

(i) The use of inventories, buffers or waiting lives consisting of stock or work in progress (W.I.P) e.g. in a computer system a printer has a buffer.

(ii) Have extra and flexible resources e.g. have extra personnel for several jobs e.g. Benetton clothing inc. it provides undyed goods and other dyes then before shipment.

(iii) Standardization – The existence of standard specifications an procedures to ease communications e.g. when the receiving sub-system knows what to expect. However decoupling has its own cost.

FORM OF DECOUPLING	**COST**
1. Inventory (stock control)	Resources e.g. materials, product and warehouses are tied up in holding the inventory.
2. Slack capacity (Extra staff)	Productive resources including people and products etc are under employment or underutilized in order to provide the slack.
3. Flexible resources	There is always a higher cost of flexible resources.
4. Standardization	There is the poor use of resources in certain cases in order to maintain uniformity.

Data and Knowledge Management

Management do not always know what information they need and information specialists often do not know enough about management to be able to produce relevant information for the managers they serve.

There is no doubt that better communication between management and information specialists, plus a wider knowledge by both groups of MIS principles would greatly facilitate the task of developing relevant and appropriate information systems. There is, unfortunately, no simple checklist of essential features which, if followed, will automatically produce the perfect MIS.

What is required is an awareness and understanding of key principles and function so that the design, implementation and operation of the MIS is the result of informed decisions and judgments rather than haphazard development without regard to real organizational requirements.

The nature of data, information knowledge and communications

The processing of data into information and communicating the resulting information to the user are the very essence of an MIS. Data is the term for collections of facts and figures: hours worked, invoice values, part numbers, usage rates, items received, etc. These basic facts are stored, analyzed, compared, calculated and generally worked on to produce messages in the form required by the user i.e. the manager, which is then termed information.

The full explanation of what is meant by information is dealt with in detail in the next chapter, but at this stage information can be briefly defined as data that have been processed and communicated in such a way as to be useful to the recipient.

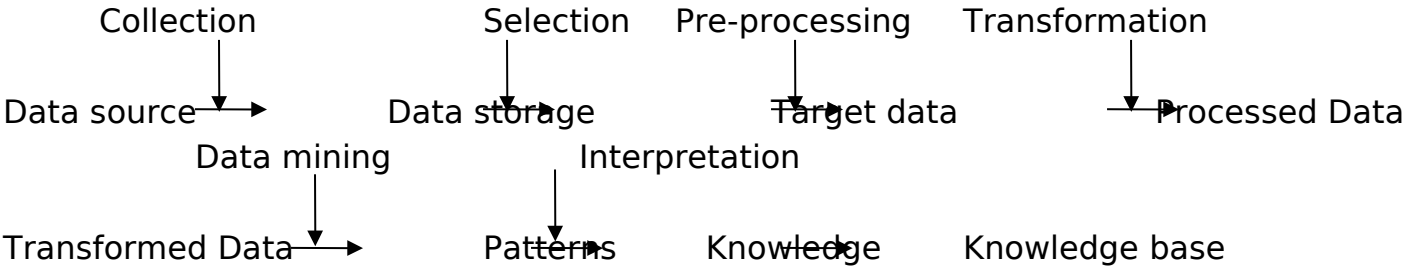
Members of management use the information produced together with the information already within their heads, called knowledge, to plan, control, and make decisions or to modify the produced information so as to share the new knowledge with others in the organization. Knowledge management, which is the tools and techniques for collecting, managing and disseminating knowledge within the organization, is of increasing importance in today's high-technology business environment.

Data lifecycle process and the knowledge discovery

Business doesn’t run on data, but they do run on information and knowledge on how to put that information to use successfully. Knowledge has always been an underlying component of a business. This knowledge is continuously derived from data.

The transformation of data into knowledge may be accomplished in several ways. It starts with data collection from various (several) sources. These details are stored in a database. This data can be pre-processed and stored into a data warehouse.

To discover knowledge the processed data may go through a transformation that makes them ready for analysis.
The analysis is done with data mining tools which looks for patterns and supports data interpretation. The result of this is generated knowledge. This knowledge is then presented to the user and is thus stored in a knowledge base.



Data and information defined

a) Data are facts, events, transactions and so on which have been recorded. They are the input raw materials from which information is produced.
b) Information is data that have been processed and communicated in such a way that they can be interpreted and understood by the recipient.

Data Characteristics

Data are facts obtained by reading, observation, counting, measuring, weighing, etc., which are then recorded. Frequently they are called raw or basic data and are often records of the day-to-day transactions of the organization.

Data are derived from both external and internal sources and whilst most external data are in readily usable and concrete forms.

Data Quality (DQ)

This is the quality of data that will determine its usefulness as well as the decisions. There are various problems associated with data quality and can be categorized into the following:-

(i) Intrinsic data quality
- Accuracy
- Objectivity
- Believability

- Reputation

(ii) Accessibility data quality
- Accessibility
- Security

(iii) Contextual data quality
- Value added
- Timelines
- Relevance
- Completeness
- Volume

(iv) Representation data quality
- Ease of understanding
- Concise representation
- Consistent representation

One of the major issues of DQ is data integrity. Older filing system may lack integrity i.e. changes made in one file is one place may not be made in the file in another place or department i.e. there is conflict of data.

Data Warehousing, Mining & Analysis

In today's fast faced and highly competitive market, the access of data is critical. The most successful companies are those that can respond quickly and flexibly to market changes and opportunities and that the key to this response is the effective and efficient use of data and information. For this an organization requires a system that is able to support:-

a) End-users easy access the data.
b) Decision being made quickly.
c) Accurate and effective decision making.
d) Flexible decision making.

- The purpose of a data warehouse is to establish a data repository that makes data accessible and really acceptable.
- The data is organized within the warehouse as a relational database so that it's easy for users to access.
- The data are organized by subject such as the vendor, product and functional area.
- Adamant is a replicate subset of a data warehouse and is dedicated to a functional or regional area e.g. many companies have marketing adamant or adamant for foreign operations.

Characteristics of data warehousing

(i) Organization - Data are organized by detailed subject e.g. price level to support relevant decisions.
(ii) Consistency - data has to be consistent in the relevant database.
(iii) Time variance – Data should be kept for a period of 5 to 10 years to allow forecasting and comparison over time.
(iv) Non-volatile – Data shouldn't change once entered in a warehouse.
(v) Relational – Data, should be stored in a relational structure to ease retrieval.
(vi) Client /server – the data warehouse uses the client /server architecture mainly to provide the end-user an easy access to its data.

Advantages of data warehousing

1. Provides a frame-work for presenting the company with the unique opportunity to restructure its I.T strategy.
2. It provides a consolidated view of the corporate data (company's data) which is better than providing many smaller views.
3. Allows information processing to be off-loaded from experience operational systems onto low cost servers.

Data warehousing is suitable for organizations which have the following:-

(i) A large amount of data needed to be access by end-user.
(ii) The operational data stored in different systems.
(iii) An information based approach to management should be in use
(iv) There is a large and diverse customer base.
(v) The same data are represented differently in different systems.
(vi) The data are stored in highly technical formats that are difficult to decode (decipher).
(vii) Extensive end-user computing is performed.

Strategic uses of data warehousing

a) Airline – they can be used for crew assignment, mixing of fares and route profitability.
b) Investment and insurance – this are used in customer tendency analysis, market movement analysis and risk management.
c) Retail –chain (supermarkets) – these are used for trend analysis, buying pattern analysis and pricing policy.

Knowledge discovery in database (KDD)

The process of extracting useful knowledge from volumes of data is known as knowledge discovery in databases (KDD).

This is supported by the following technologies:-

1. Massive data collection
2. Powerful multiprocessing computers
3. Data mining algorithms (procedures).

Stages in the evolution of knowledge discovery

	Evolution stage	**Business Question**	**Enabling technology**	**Characteristics**
1.	Data collection (1960)	What was my total revenue in the last 5 years?	Computer disks and tapes	Static data delivery
2.	Data Access (1980s)	What were my unit sales in TZ in last March?	Relational Database and SQL (structured query language)	Dynamic data delivery at record level.
3.	Data warehousing (1990)	Could you drill-down to Dares-Salaam?	Active analytical processing (OLAP)	Dynamic data delivery at multi-levels
4.	Intelligent Data mining 2000 and over	What is likely to happen to sales in Dares-Salaam in the next month and why?	Advanced algorithms and massive databases (Data marts).	Proactive information delivery.

Online analytical processing: (OLAP)

This refers to the searching of end-user activities such as the DSS modeling using spreadsheet and graphics which are done online.

The objective of this is to look for conditions and patterns, trends and exceptional characteristics.

1. Access very large amount of data e.g. several years of sales data.
2. Analyze the relationship between many types of business elements such as sales, products, region and channels.
3. These involve aggregated (averaged) data such as sales volumes, budgeted shillings or pounds and pounds speat.
4. Compare aggregated data over time periods e.g. monthly, quarterly and yearly.
5. Present data is different perspectives such as sales by region v/s sales by product or by product within each region.
6. It involves complex calculations between data elements such as expected profits calculated as a function of the sales revenue for each type of sales channels (mode of distribution).

Data mining:
It derives its name from the similarities between searching for value business information in a large database and mining on a mountain for mineral ores. This is the going via immerse volumes of data to generate business opportunities.

Characteristics of data mining

1. Involves discovery of data buried deep within very large databases sometime stored for several years.
2. The data is consolidated in a data warehouse, the internet and the intranet.
3. The environment has a client /serves architecture.
4. Data mining tools help remove the information one buried and corporate files.
5. The miner is often the end-user empowered by data drills and other power query tools to ask adhoc questions and get answers quickly with little or no programming skills.
6. Data mines can use several tools and techniques.
7. Data mining yields 5 types of information:-
    (i) Association information
    (ii) Sequences information
    (iii) Classification information
    (iv) Cluster information
    (v) Forecasting information.

8. Because of the large amounts of data its sometimes necessary to use parallel processing for data mining.
    Data visualization refers to the representation of data by technologies such as digital images; graphical user interfaces or animations visualization software packages often use capabilities for self-guided exploration and visual analysis of large amounts of data.

Data mining can also be applied in:-

1. Identifying individuals or organization most likely to respond to direct mailing.
2. Determining which products or services are commonly purchases together (complementary products) e.g. bread and blue band.
3. Predicting which customers are likely to switch to competitors.
4. Identifying which transactions are likely to be fraudulent.
5. Identify common characteristics of customer who purchase the same products.

INFORMATION AND MANAGEMENT

What is information?

Information is data that have been interpreted and understood by the recipient of the message. It will be noted that the user not just the sender is involved in the transformation of data into information. There is a process of thought and understanding involved and it follows that a given message can have different meanings to different people. It also follows that data which have been analyzed, summarized or processed in some other fashion to produce a message or report which is conventionally deemed to be 'management information' only because information is understood by the recipient.

In summary, information is knowledge and understanding that is usable by the recipient. It reduces uncertainty and has surprise value. It must tell the recipient something not already known and which could not be predicted. If a message or report does not have these attributes, as far as the recipient is concerned, it contains merely data not information. This is a crucial point not always fully appreciated by information specialists.

Ideally, managers should be able to define the type of information they require and the MIS should be able to supply it. In practice, of course, it does not happen like this and managers have to use whatever information is available, from whatever source. As Drucker said:

> "The manager will never be able to get all the facts he should have. Most decisions have to be based on incomplete knowledge - either because the information is not available or it would cost too much in time and money to get it. There is nothing more treacherous or alas, more common, than the attempt to make precise decisions on the basis of coarse and incomplete information.
>
> *(Drucker, Management: Tasks, Responsibilities, Practices, 1993)*

In spite of the difficulties of producing it, managers need relevant and timely information to assist them to plan, to control and to make decisions. Relevant information is information which:

A. increases knowledge
B. reduces uncertainty
C. is usable for the intended purpose.

A worthwhile extension to the well-known adage that 'management get things done through people' would be that, 'management get things done through people, by using relevant and timely information'.

Although all managers need information they do not all need the same type of information. The type of information required is dependent on many factors including: the level of management, the task in hand, confidentiality, urgency, etc.

Information classifications

Information has many characteristics and can be classified in numerous ways including:

by source: e.g. internal, external, primary, secondary, Government

by nature: e.g. quantitative, qualitative, formal, informal

by level: e.g. strategic, tactical, operational

by time: e.g. historical, present, future

by frequency: e.g. continuous (real time), hourly, daily, monthly, annually

by use: e.g. planning, control, decision making

by form: e.g. written, aural, visual, sensory

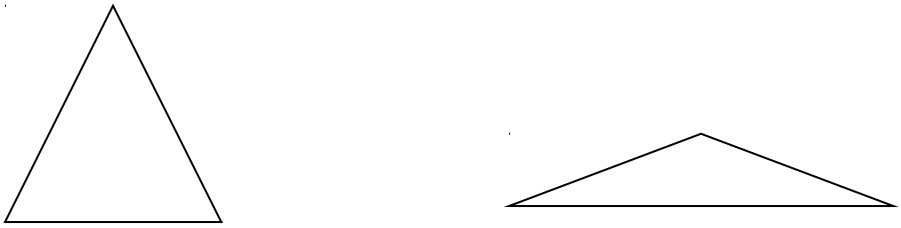
by occurrence: e.g. at planned intervals, occasional, on demand

by type: e.g. detailed, summarized, aggregated, abstracted.

ORGANIZATION'S STRUCTURE, CUTLURE AND CHANGE

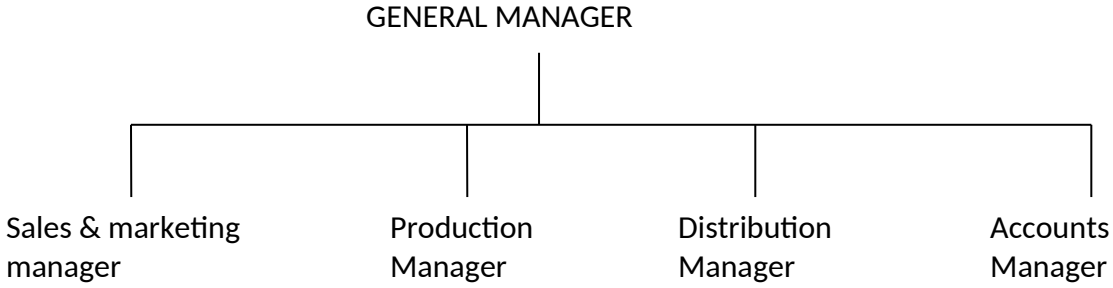
These are 4 basic forms of organization structure:-

1. Hierarchy of Authority
   This is illustrated as a pyramid. In this structure each position has authority commonly associated with it and a span of control. (These are the number of sub-ordinates working under a particular authority). This may be narrow or wide giving raise to Tall and Flat structure.



TALL FLAT

2. Specialization: This is the division of labor in an organization. Its usually based on the different functions such as marketing, accounting, production and distribution.



3. Formulation: Extent to which rules and procedures exist to handle organizational activities. An indication of formalization is the extent to which decisions can be programmed.

4. Centralization: This refers to the organizational structure where decision making occurs either at the top level or low level.

Organization culture can be perceived as:-

1. Either using High technology or low technology.
2. Either a price leader or a price follower.
3. Produce high quality or low quality goods.
4. They are industry innovators or imitators.
5. Either selective marketer or mass marketers.
6. Risk takers or risk evaders.

Managers seek to change the culture of the organization. What they try to do is shape the way people behave, feel, contribute, interact and perform as employees of the organization. This is usually called leadership. They initiate debates and set priorities.

New polices, methods and roles are introduced to shape behaviors, encourage, promote and require – to push certain expectations of performance in the business and thus to control.
In other words culture is organizational terms is broadly the social and behavioral manifestation and experiencing of whole range of issues such as:-

1) The way work is organized and experienced.
2) How authority is exercised and distributed.
3) How people are and feel rewarded organized and controlled.
4) The values and work orientation of the staff.
5) The degree of formalization, standardization and control through systems.
6) The value placed on planning, analysis, logic and fairness etc
7) How much initiative, risk taking, scope of individuality and expression is given.
8) Rules and expectations about such things as informality in interpersonal relations, dressing etc.
9) Emphasis given to rules, procedures, specifications of performance and results, team or individual working.

We are born in a culture; we take up employment in a culture. We might therefore argue that the culture of an organization affects the type of people employed, their career aspirations, their education backgrounds and their status in society.
Organizational power is the ability to obtain and utilize human and material resources to accomplish objectives. Organizational change is the natural growth and decline in the process within the organization which may be caused by unstable goals and project changes etc.

The following factors have led to changes in the business environmental as a result of information systems solution:

1. **The emergency of global economy (Globalization):-**
   This involves management and control in a global market place, competition is the world market global work groups and global delivery systems. Today, information systems provide the communication and analytical power that firms need for conducting trade and managing businesses on a global sale.
   Controlling involves communicating with distributions and suppliers operating 24 hours a day in different national environment, servicing local and international reporting needs, therefore business needs powerful information systems in response.
   Globalization and I.T also threatens the domestic business firm as customers can shop in a worldwide market. This increased competitor and forces firms to play in an open and unprotected worldwide market.

2. **Transformation of industrial economies (industrialization).**
   Major industrial powers are being transformed from industrial economies to knowledge and information based economies while manufacturing has been mainly to how wage countries (cheap labor).
   Knowledge and information intense products require a greater deal of leaving and knowledge to produce. This has led to enhanced productivity, new products and services, shorter product life cycles and a turbulent environment. And as such across all industries information and technology that delivers it has become critical. Information systems are needed to optimize the flow of information and knowledge within the organization to help management maximize the firm's knowledge resources. And because of the productivity of the employees, this would be dependent on the quality of the system servicing them and it's critical to the survivor of the firm.

3. **Transformation of the business enterprise**
   There has been a transformation in the organization and management of funds. The traditional business firm is hierarchical, centralized and structured with an arrangement of specialist flat typically rely on a fixed set of standards and a set of operating procedures (SOPs).
   The new style of a business firm is flattered, decentralized, flexible arrangement of generalists who rely on instant information to deliver mass produced products and services uniquely suited to specific markets and customers. The traditional management group relies on formal plans, a rigid division of labor, formal rules and

appeals to loyalties to ensure the proper operation of the firm. For this to be possible an organization requires powerful information systems.

The Networked Enterprise

Computing power is during organizations into networked enterprises, allowing information to be instantly distributed within and outside the organization.

New ways of conducting business electronically have emerged

1) **Flattering organization** – this has led to organizations to have fewer levels of management with low level employees being given greater decision making authority. Networked computers have made it possible for employees to work together so a team.

2) **Separating work form location** – Communication technology has eliminated distance as a factor for many types of work in many situations. Sales personnel can spend more time in the field with the customer and still have up-to-date information while carrying much less paper work.
   Networked information says are allowing companies to co-ordinate geographically located branches and more so coordinate other organizations as virtual organizations. These are organizational using networks and linking people, assets and ideas to create and distribute products and services without being limited by traditional boundaries or physical locations.

3) **Organization of workflows –** Information systems have progressively replaced manual work procedures with automated procedure and work flows. This has reduced the cost of operations in many companies. This has also led to an increase in the flexibility of the organization.
   Companies can use communication technology to organize and increase the ability to respond to changes in the market place and take opportunities when they arise.

4) **The Changing Management Process:**
   Information systems are providing powerful capabilities to help in the process of management. Managers can obtain information on their organizations performance down to the level of specific transactions just about anywhere in the organization at any time.
   These organizations use enterprise resource planning system (ERPS) which is able to integrate the different facets within the company such as manufacturing, planning, and sales and finance so that they can become more coordinated by sharing information with each other.

   Examples of ERP systems available include;-

- Macula - SAP - Scala - JBA - Oracle
- Mavisino - Baan - Sun system - JD Edwards

5) Redefining Business Boundaries

Networked information systems can enable transactions such as payments and purchase orders to be exchanged electronically among different companies thereby reducing the cost of obtaining products and services outside the firm.

Chapter 2

USE OF INFORMATION SYSTEMS IN MANAGEMENT

Information system

Information system has been defined in terms of two perspectives: one relating to its function; the other relating to its structure. From a functional perspective; an information system is a technologically implemented medium for the purpose of recording, storing, and disseminating linguistic expressions as well as for the supporting of inference making.
From a structural perspective; an information system consists of a collection of people, processes, data, models, technology and partly formalized language, forming a cohesive structure which serves some organizational purpose or function. The functional definition has its merits in focusing on what actual users - from a conceptual point of view- do with the information system while using it. They communicate with experts to solve a particular problem. The structural definition makes clear that IS are socio-technical systems, i.e., systems consisting of humans, behavior rules, and conceptual and technical artifacts.

An information system can be defined technically as a set of interrelated components that collect (or retrieve), process, store, and distribute information to support decision making and control in an organization. In addition to supporting decision making, coordination, and control, information systems may also help managers and workers analyze problems, visualize complex subjects, and create new products.

Three activities in an information system produce the information that organizations need to make decisions, control operations, analyze problems, and create new products or services. These activities are inputting, processing and outputting. Input captures or collects raw data from within the organization or from its external environment. Processing converts this raw input into a more meaningful form. Output transfers the processed information to the people who will use it or to the activities for which it will be used. Information systems also require feedback, which is output that is returned to appropriate members of the organization to help them evaluate or correct the input stage.

Components of an Information System:

The components that make up an IS are:-

1. Hardware – This is a set of devices such as the processors, printers and monitor. Also includes mainframes and minicomputers that can accept data and process them respectively.
2. Software –A set of instructions or program that enable the hardware to process data. These can be classified into system software and application software.
3. Databases – This is a collection of related files or tables that store data and their association or relations among them.
4. Network – This is a connecting system that allows the sharing of the resources by different computers.

5. Procedures – This is a set of instructions about how to combine the above components in order to process information and generate the desired output.
6. People – These are the individuals who work with the system or use its output

Importance of Information system in management

The main purpose of Information System is to provide the management the necessary information for decision making. In order to achieve this purpose MIS is to perform the following functions.

Collection of data: The first function of MIS is to collect necessary data from both internal and external sources of the organization. The data of the organization which have already been gathered are kept in some physical medium such as a paper form or entering it directly into computer system.

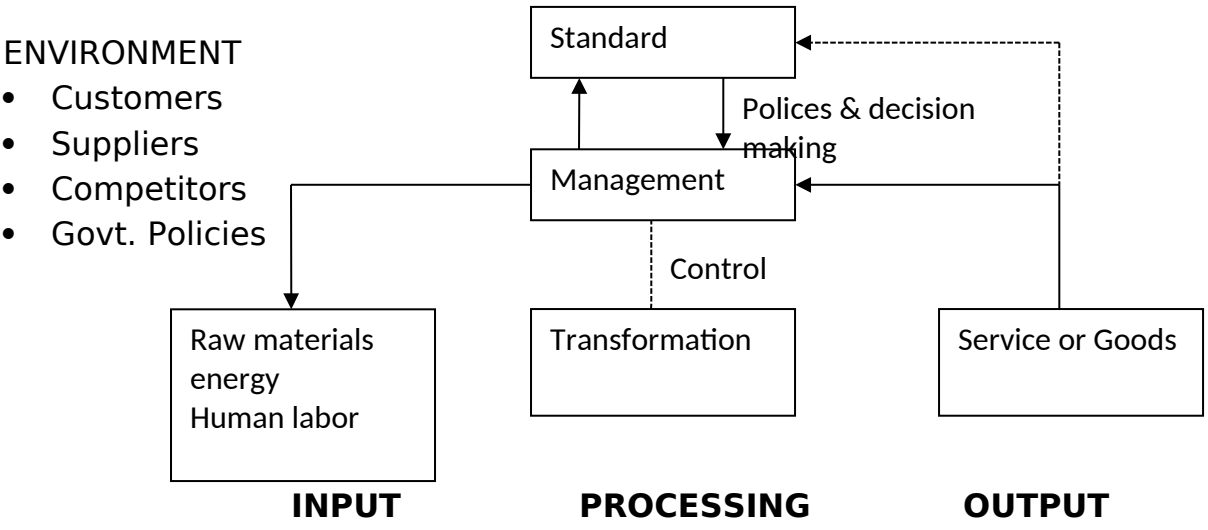
(i) Processing data: After storing the data, the next important function of MIS is to process the same. In the processing, the data are converted to require management information, calculating company, sorting, classifying and summarizing etc. are the necessary activities to be done for processing the data.

(ii) Storage of information: Under the MIS, necessary data and information are carefully stored, so that it can save time for searching the same. Generally, data and information are stored by reserving and organizing them in the form of files, records and databases for future use.

(iii) Retrieval of information: Another function of MIS is to retrieve the information to meet the exact management information demands. So retrieval should be done as per the requirement of the management users.

(iv) Disseminating: Disseminating is the last function or finished product of MIS. By disseminating the data and information are divided and distributed to the users in an organization. This can be done through reports or outline through computer terminals periodically.

An Organization as a System



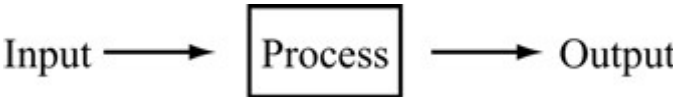
CONTROL PRINCIPLES

Control is the process of ensuring that operations proceed according to plan and at the most basic level-this is done by comparing the actual results or output of the system against a target and using any differences found to adjust the input side of the system so as to bring activities in line with the target. In practice the target may be termed a norm, a budget a standard, a performance or stock level and so on.

Types of Control Systems

There are basically two types of control system: the open loop system and the closed loop control systems.

(i) Open loop control system



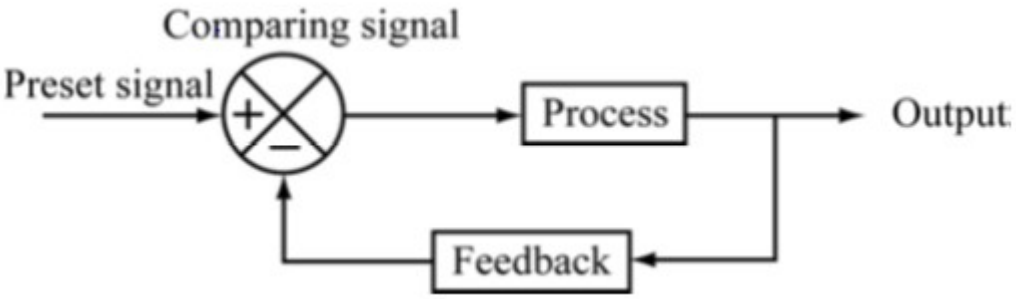
This is a simple open loop control system. Its operation is very simple, when an input signal directs the control element to respond, an output will be produced. Examples of the open loop control systems include washing machines, light switches, gas ovens, etc.

The drawback of an open loop control system is that it is incapable of making automatic adjustments. Even when the magnitude of the output is too big or too small, the system will not make the appropriate adjustments. For this reason, an open loop control system is not suitable for use as a complex control system. Sometimes it may even require monitoring and response from the user.

(ii) Closed loop control system

Sometimes, we may use the output of the control system to adjust the input signal. This is called feedback. Feedback is a special feature of a closed loop control system. A closed loop control system compares the output with the expected result or command status, and then it takes appropriate control actions to adjust the input signal. Therefore, a closed loop system is always equipped with a sensor, which is used to monitor the output and compare it with the expected result.

The diagram shows a simple closed loop system. The output signal is fed back to the input to produce a new output. A well-design system can often increase the accuracy of the output.



Feedback

This is the gathering of information on past performance from the output of a system, department or process and using it to govern future performance by adjusting the input size of the system.

Feedback can be divided into positive feedback and negative feedback.

(i) Positive Feedback

This causes a system to amplify an adjustment or an action. It acts in the same direction as the measured deviation i.e. this reinforces the way the system is moving and if thought to be beneficial.

If an advertisement increased the sales further advertisements may be considered.

(ii) Negative Feedback

This is feedback seeking fluctuation around a norm or a standard. The corrective action is on the opposite side of the deviation e.g. production quantities below the plan may require an increase in labor.

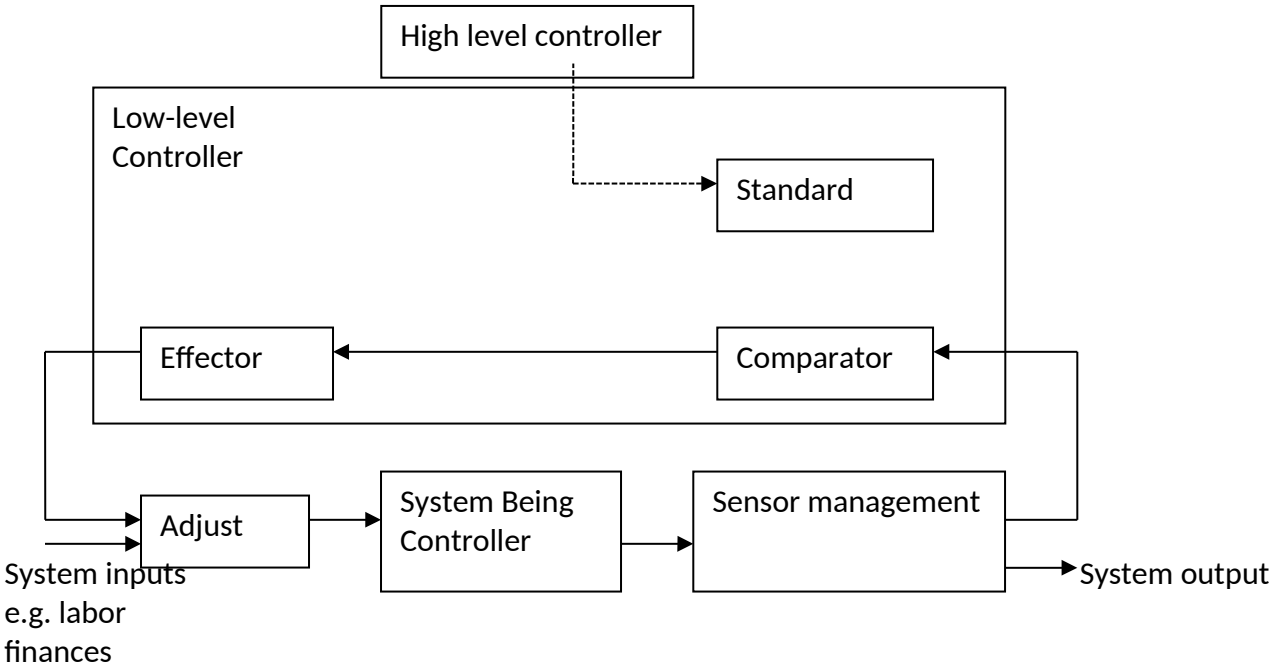
One advantage of using the closed loop control system is that it is able to adjust its output automatically by feeding the output signal back to the input.

In a closed loop control system, the controlled variable (output) of the system is sensed at every instant of time, feedback and compared with the desired input resulting in an error signal. This error signal directs the control elements in the system to do the necessary corrective action such that the output of the system is obtained as desired.

The feedback control system takes into account the disturbances also and makes the corrective action.

These control systems are accurate, stable and less affected by noise. But these control systems are sophisticated and hence costly. They are also complicated to design for stability, give oscillatory response and feedback brings down the overall gain of the control system

Feedback Loops



1. SENSOR- This is the measuring and recording device for example automatic metering or some kind of paper work.
2. COMPARATOR – This is he means by which comparisons of actual results and the plan are achieved e.g. A clerk or a computer program.
3. EFFECTOR – This could be a manager or supervisor acting on the report to make adjustments.

The procedure outlined above, i.e. input - process - output - monitor and compare - adjustment, requires what is known as a feedback control loop and such a loop is a common feature of many aspects of MIS, for example, stock control, budgetary control, production control and so on. It will be realized that the basic system described is relatively mechanistic and is therefore not necessarily suitable for all facets of the organization's activities.

Feed Forward

Where a self-regulating feedback system is not able to control a process adequately it may be feasible to use feed forward. This is where monitoring at some early stage of a system or process may indicate that an adjustment should be made at a later stage of the process, prior to the final output. Feed forward is not an automatic process and requires management intervention for it to operate successfully and, consequently, it does not have the degree of 'automatic' control inherent in a feedback system.

Timing of Control

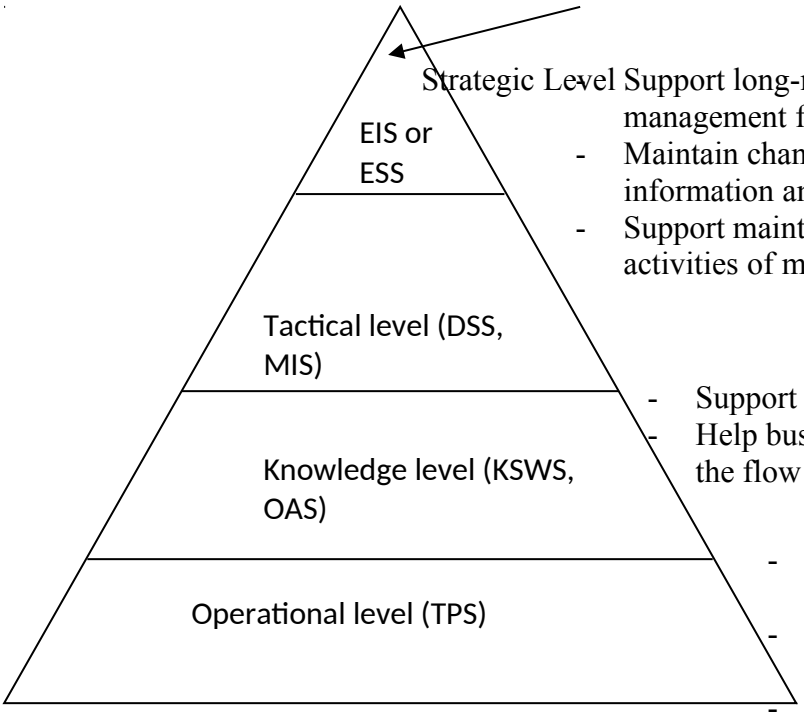
Control is most effective when the time rank between the output and the corrective action is minimal. The speed of control is influenced by organization structure and the reporting period. Managers may be unable to effect control due to the following reasons:-

1. The subject covered is outside manager's control.
2. The information comes too late for effective action to be taken.
3. Insufficient details are provided.
4. The information that is provided is in a form that isn't understood.

PLANNING

Information Systems and Organizational Structure

An Information System is a composition of people, procedures and equipment that provide information to the management to be able to make appropriate decisions. This can now be illustrated in the following pyramid.



Strategic Level Support long-rays planning activities of semi level management from both environment and internally.
- Maintain changes in external environment with existing information and activities
- Support maintaining and decision making and administrative activities of middle level management

- Support knowledge and data worker in organization
- Help business to integrate new knowledge and control the flow of paper work in the organization.

- Monitor elementary activities and transaction of the organization.
- Answer routine questions and track flow of information in organization
- Must be current and accurate.

1. Operational System
   They monitor elementary activities and transactions of the organization e.g. sales, receipts, cash deposits, payroll and flow of materials in the factory.
   The main purpose of these systems is to answer routine questions and track the flow of information in the organization. To answer this information must be available, it should be current and accurate e.g. a bank deposit query from a bank A.T.M.

2. Knowledge Level Systems
   This supports knowledge and data workers in the organization. It may help businesses to integrate new knowledge and to control the flow of paper work in the organization.

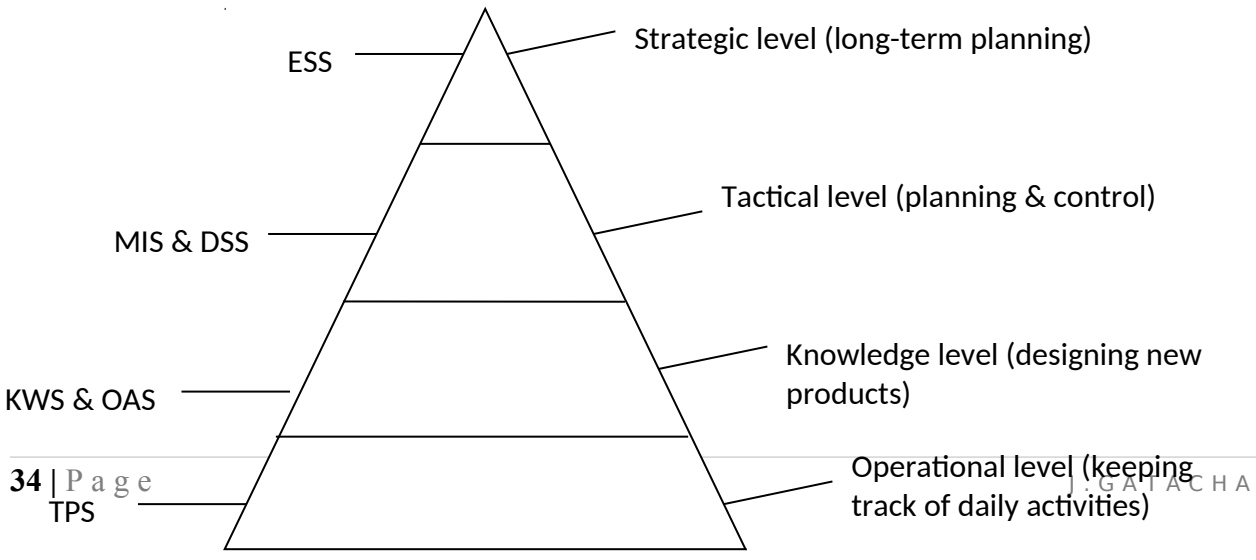
3. Management /Tactical Level Systems
   They support the monitoring, controlling and decision making and administrative activities of middle level managers e.g. they may be required to compare the current data with the past. These systems produce reports rather than instant information on

the operations. They may focus on the less structures decisions for which information requirements aren't always clear and attempt to answer the 'what if' questions.

4. Strategic Level Systems
   These support the long-range planning activities of the senior level management both from the environment and internally. Their main concern is maintaining changes in the external environment with the existing information and activities.

	Level of management	**Typical responsibility**	**Planning Horizon**	**Decision type**	**Accuracy**	**Source of information**
1.	Strategic	Setting Organization goals, long-term plans and policies	Normacy takes period of 5-10 years depending on the project	Non-structured & subject to many changes	Very low Accuracy	Mostly from outside the organization and internal
2.	Tactical	Setting and monitoring org. budgets, meeting the strategic goals & developing operations objectives and policies	Usually takes 1 to 3 years	Semi-structured and based on the managerial experience	Reasonable accuracy e.g. when setting budgets and targets	A mixture of internal and external sources e.g. what is happening to the competitors.
3.	Operational	Effective use of existing facilities and resources. Concerned with day-to-day running of the organization	Usually a week or less day to day	Structures and hardly require human intervention.	High accuracy required e.g. tracking the cost to a cent	Captured from source documents.

Types of Information Systems



TRANSACTIONS PROCESSING SYSTEMS (TPS)

These are the basic business systems serving the operational level of the organization. A TPS is a computerized system that performs and records the daily routine transactions necessary to conduct the business e.g. sales order entry, invoicing, hotel bookings, payroll and shipping data. At this level tasks, resource and goals are predefined and are highly structured e.g. the products that are out of stock and the slow moving stock.

TPS are central to an organization such that if there is a failure it can bring the organization to a standard still. The information inputs for the TPS are in the form of transactions and events. Processing involves sorting, listing, merging and updating.

The information output are detailed reports which are given to the operational staffs and supervisors.

It provides the input data for many other systems. T.P.S is critical to the success of any organization since they support the law level operations such as purchasing o raw materials. Billing customers and preparing the payroll etc.

The objectives of T.P.S are:

1. To provide all information needed by law or by the organization policy to keep the business running properly and efficiency.
2. Provide timely documents and reports.
3. Increase the competitiveness of the organization.
4. Provide necessary data for tactical and strategic systems e.g. the DSS.
5. To assure accuracy and integration of data and information.
6. To safeguard assets and security of information.

NB: T.P.S is the most likely candidates for re-engineering and usually yield the most tangible benefits of I.T. investments.

Major characteristics of T.P.S

1. This involves large amounts of data to be processed. Sources of this data are mostly internal.
2. T.P.S process information regularly e.g. Daily or Weekly.
3. Due to the voluminous information that is processed a higher storage capacity is required.
4. Due to these high volumes, high processing speeds are needed.
5. T.P.S systems monitor and collect current and past data.
6. The inputs and the outputs are highly structured (programmable).
7. A high level of details is usually observed in the input.

8. This system requires a high level of accuracy, data integrity and security.

Activities and methods of TPS
There are 2 transactions processing modes namely;

1. **Batch processing**
   Business transactions are corrected as they occur and are accumulated over a period of time and prepared for input as a single unit or batch. This is normally processed periodically e.g. monthly, examples include the payroll and the general ledger.

2. **Interactive /Real-Time processing**
   The transactions data are processes immediately without delay e.g. inventory systems, ticketing systems, reservation systems and A.T.Ms.
   T.P.S can also be based on a client /server and internet technologies. Innovations such as online transactions processing (OLTP) can serve many people by allowing suppliers to enter the TPS and look at the inventory level.

Types of TPS (FUNCTIONAL TPS)

1. **Order processing**
   This is necessary to ensure that the customer orders are filled in a timely manner and that sufficient finished goods are always available.
   Sales people in many organizations will enter order from client sites using portable wireless computers.

2. **Inventory /Stock Control**
   A manufacturing firm will have several inventories such as raw materials, work in progress (W.I.P) and finished goods. These could also contain maintenance parts. The inventory T.P.S monitors stock going out or coming in to the organization via its various warehouses and plants.

3. **Accounts Receivable /sales ledger or Debtor ledger**
   This manages the cash flow of the company by keeping track of the money owned on changes for the goods sold. The system updates records and raises an invoice /statement regularly.

4. **Account payable /purchase ledger or creditor ledger**
   Keeps track of money owed to company by various creditors or suppliers.

5. **Payroll**

This monitors the salaries and has the primary output as checks and pay slips to be distributed to the employees and provides a payroll register which is a summary of all the transactions.

6. **Human Resources**
   This system gives the information about the employees for personnel planning and government reporting and also the management of the company to benefit from other programmes. These include information on the employee's e.g. net pay, deductions e.t.c.

7. **General ledger**
   This is a record of the monetary transactions e.g. payment to suppliers, receipts from customers and payments to employees. It will give financial statements such as the trading and profit and loss account, the trial balance and the balance sheet.

Knowledge Work and Office Automation System (KWS & OAS)

KWS are the systems that secure the knowledge workers. They do assist the knowledge workers in the creation and integration of new knowledge in the organization. The knowledge workers are the people who have the responsibility of creating or finding new sources of information. This includes engineer doctors, scientist and programmers. Processing involves modeling and simulations. The information outputs are models and graphics for professional and technical staff.

Office Automation system are computer system this include word processors, emails and scheduling system, designed to increase the productivity of the data workers in the office.

Data workers have less formal qualifications and tend to process information a lot is already available. This includes secretariat, accounts, filling clerks or managers whose jobs include the use, manipulation or dissemination of information.

Information inputs are documents and schedule – processing includes, delegation scheduling and communication. The outputs are clerical schedules and the mails for clerical workers.

Management Information System (MIS).

They are information system at the management level that assists in the planning, controlling and decision making. They are oriented towards internal rather than external events. To a high degree they depend on the information from the T.P.S. They summarize and report on the basic operations of the company.

They are used for comparing performance i.e. they give an analysis of the past and present.

Information inputs are summary transaction data high volume data and simple models.

The processing includes routine reporting, simple modeling and low level analysis. The outputs are summary and exceptional reports for middle managers.

Adhoc reports are reports that aren't available immediately but can easily be generated by specifying certain parameters at any given time.

Exceptional reports are the reports that give a deviation in controls within a certain system e.g. payroll where employee's way is listed those that have negative salary.

MANAGEMENT REPORTING SYSTEMS (M.R.S)

A M.R.S is a computer system capable of integrating data from many sources to provide data and information. They are useful in supporting operations, management and decision making in organization. MRS extracts data processes and product meaningful results. The main aim of an MRS is to identify potential problems on areas of opportunity for improvement.

Characteristics of MRS system

1. It's oriented towards reporting on the past and the present rather than projecting the future hence the need for warehouses.
2. This is usually designed by MIS professionals rather than end users over extensive time periods.
3. This is built for situations in which information requirements are reasonably well known and are expected to remain stable.
4. Have limited analytical capabilities.
5. Generally report on internal company operations.
6. Present information in standard formats.
7. Provide feedback path in target /budget vs. actual enabling management control.

1. **A detailed report.**
   Such a report is frequently used to verify that the transactions have been entered and processes corrected. Such a report is however long and not good for reporting trends or problems (progress).

Order no.	Customer code	Sales person	Shipment date	Qty	Item	Amount

2. **Summary Report**
   Brings together one or more related transactions and shows the total results. Whereas the detailed report would give all the sales made in the company within a specified time period, the summary report will indicate the sales amount for all the personnel in the sales department within the specified period.

3. Exceptional Reports

These reports display data only about exceptional conditions. It records abnormal cases e.g. customers who have exceeded their credit limit but are receiving their goods or products and that their current credit limit is negative according to the system.

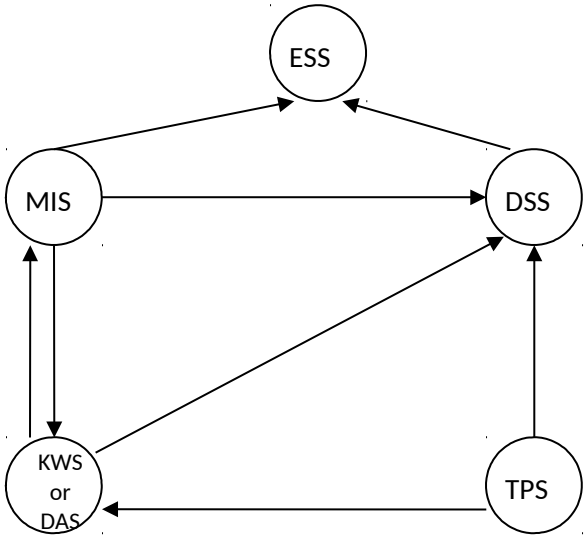
Management reports can be produced on 3 occasions i.e.

i) Either periodic /schedule
They are prepared on a regulator basis i.e. weekly or quarterly.

ii) Exceptional
They are produced whenever certain conditions are met or not met e.g. products below the re-order level.

iii) On demand or adhoc
They are prepared whenever they are required by the end user.

No.	Types of report	Timing or trigger	Exception	On demand
1.	Detailed	Daily input list of sales	Individual sales over 10,000	Sales by sales person by product
2.	Summary	Daily total sales and Daily monthly sales	Sales people exceeding 5,000	Total sales by sales person and total sales by customer
3.	Exceptional	Daily error limit		



Controls of Transaction Processes

The audit trail tracks document numbers, transaction references and the respective dates and times. This is to ensure the accuracy integrity and security needed by the T.P.S needed.

Most fraudulent transactions are performed at the transactional, operational level.

Several controls of the T.P.S include;

1. **Source document control.**
   a) We use pre-numbered documents to enable proper accounting.
   b) We make use of batch and harsh totals.
   c) We record all documents produced by the by-products of the transaction.

2. **Information processing control.**
   This is designed to ensure that information services conform to the organizations objectives and policies and that information produced is complete and correct e.g. verification and validation.

3. **Information systems management and control.**
   These are responsible for the development and operations of all information systems.
   a) This is to make sure that the maintenance of systems is undertaken by qualified staff through selection, training and evaluation.
   b) This ensures that appropriate hardware and software are purchased.
   c) This is to have the scheduling of work of the development staff so as to monitor progress.
   d) To ensure control over the database design, authorization and access.
   e) To establish and enforce the guidelines and standards so as to meet end-user objectives.

Decision Support Systems

Information systems for the management level that combine data and sophisticated analytical models on data analysis tools to support semi-structured decision making.

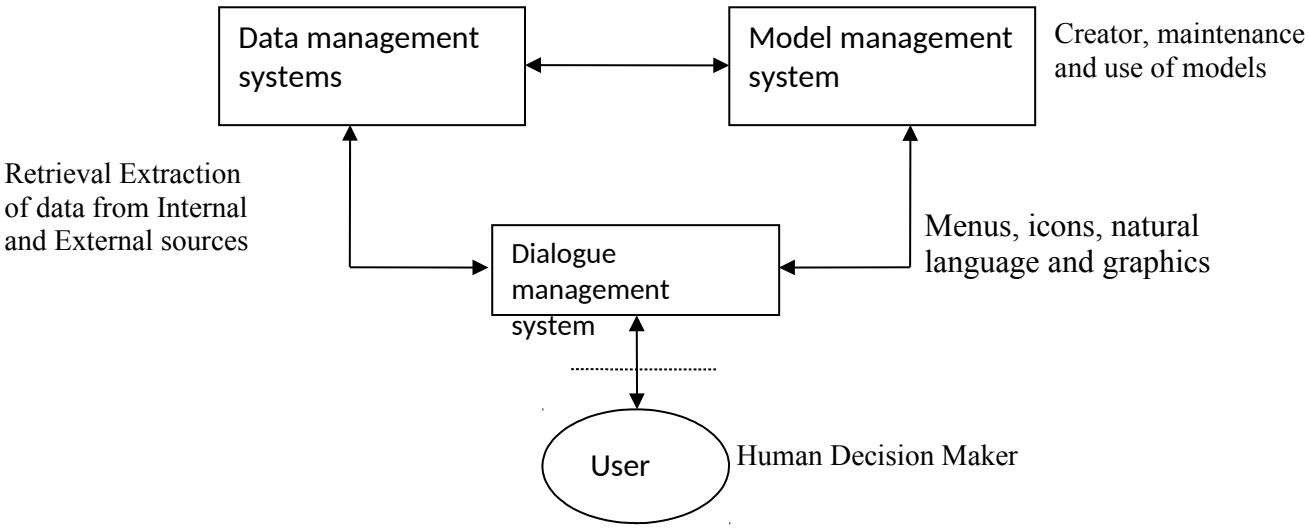
- They are used where decision are unique or rapidly changing and aren't easily specified in advance.
- They use internal information from TPS and MIS and also bring information from external services
- These systems have more analytical power than any other system and have an interface that is interactive and user friendly.
- The information inputs are low volume data or massive databases which have been optimized for data analysis and analytical modeling.
- Processing involves interactive simulations and analysis and the outputs are special reports, decision analysis and responses to queries

Characteristics of decision support system

1. They are developed with the participation of individual managers or a group of managers to support a range of decisions. Some decision support system are simple and may be developed with a spreadsheet package e.g. Ms Excel or Lotus 123.
2. DSS are built to be modified so as to adapt to the user requirements.
3. DSS directly support the decision making process.
4. They have the strengths of projecting possible future situations during the planning process using the "WHAT IF" mode e.g. what if we increase the advertising expenditure by 5% and the "GOAL SEEKING" mode e.g. what would it take in terms of input factors to achieve a particular performance?

5. It has extensive analytical capabilities using logical and mathematical manipulation of data.
6. It combines one internal and the external information so as to build its own databases.
7. It has a graphic facility to portray the decision situation rather than the tabular display or data.

COMPONENTS OF A D.S.S



Data Management System (SUB-SYSTEM)

It relies on a variety of internal and external databases. The extraction procedures are specified by a specialist rather than an end-user paying attention to data consistency across multiple support systems.

Model Management System

A model is an abstract representation that illustrates the components or relationships of a given situation. Models can be physical e.g. an airplane model. It can be mathematical e.g. an equation or it can be verbal e.g. the description of a procedure for writing an order. It may also be statistical e.g. the mean, median, mode, the variance and the standard deviation or they can be optimization models, forecasting or sensitivity analysis model asking the WHAT IF questions to determine the impact of changes in one or more factors or outcomes.

The power of a D.S.S. relies on the user's ability to apply quantitative and mathematical models to data or even statistical. These may include:-

i) Market responses models – this show how sales depends on factors such as price and promotion.

ii) Simulation models – this generates input values randomly from probability distribution e.g. to determine the number of operators or cashiers needed.

iii) Optimization models – these are developed by management scientists for the allocation of resources to maximize profits or minimize costs and time. They are usually based on linear programming.

Dialogue Management System (SUB-SYSTEM)

Since the D.S.S has the ability to apply models to large volumes of data from a variety of sources, the advantage of a D.S.S is that the user finally and has a flexible interface between the human decision maker and the computer system. These sub-systems support multiple forms of input and output. A.I has improved on this by adding the ability to specify what is required in a subset of national language on activate the system by voice. The windows capability enables the user to maintain several activities at the same time. Extensive computer graphics are also utilized and the kind of dialogue will take the following form:-

a) Who is the biggest?
b) How do circumstances change over a given time?
c) How will one fact predict another?
d) What is typical or exceptional?

Classifications of DSS

They can be classified by the manager's level i.e. operational tactical or functional area e.g. marketing, finance and personal among others.

1. Data Access System
   They provide a user friendly interface and adhoc access to the database. This is similar to what is offered by database management through a quarry language.
   These systems are meant for operational control.
2. Data Analysis System
   They help to analyze historical and current data either on demand or periodically e.g. comparing the performance with that of the competitors.
3. Forecast-oriented Data Analysis systems
   They assist in developing product plans including market segment forecast, sales forecast and analysis of competitive actions. Their operation is based on access to a variety of internal and external sources, marketing and product databases including a series of historical data.
4. Systems based on Accounting Models

They consider alternative options for planning purposes based on accounting deviations and relationships. They produce estimated income statement and balance sheet and they use the “what if” mode of alternatives.

5. Systems based on representation models
   They show the dependence between a controllable variable e.g. the price of a produce and an outcome such as sales. And they use simulation models to yield probabilistic results.

6. Systems based on optimization models.
   They are used by management scientists to determine optimal allocation of resources or the best possible schedule e.g. the use of linear programming to maximize an objective such as profit.
7. Systems with suggestion models.
   These actually suggest decision rather than evaluating alternatives. They are used in narrow domains of knowledge and are based on the expert system technology e.g. suggesting a product price or a production volume.
   They have the same capabilities and limitations like expert systems. Data oriented decision support systems support easier places of decision making i.e. the intelligence, the decision and the choice places are supported by model oriented DSS.

When to use decision support systems

1. When there is vast amount of data to be processed.
2. When there is a large amount of computation or data manipulation that have complex interrelationships.
3. When there is an analysis of stages requiring the “WHAT IF” approach.
4. When human judgment is required.
5. When communication is required and several people contributing some special expertise are involved.
6. When the decision maker is comfortable with the use of quantitative methods to enhance decision making.

The Building of the DSS

D.S.S acquisition depends on the technology applied and the nature of the decision task that need support. D.S.S technologies include;-

1. Specific D.S.S – This is the actual system that a manager works with during the decision process. It’s built using D.S.S generators or tools.
2. D.S.S Generators – This is a software package that provides capabilities for building a specific D.S.S rapidly and easily. The common characteristics are that much of the processing and data accessing functionality is already programmed into to generator. Examples of generators are express, PC Express, Focus, Nomad 2 Lotus 1, 2, 3 and Ms Excel.

3. D.S.S. Tools – This programming language with good capabilities for accessing arrays of data e.g. APL, a plain spreadsheet, a statistical package SPSS or SAS or a DBMS with a Query facility which can be used as a building block to contract a D.S.S generator or A specific D.S.S.

"Who builds a D.S.S?"
This is done by the end users and the MIS professionals. It involves the following groups of people:-

1. The manager is the end-user and the MIS professionals. It involves the following groups of people.
   i) The manager is the end-user of a specific DSS on a knowledge worker who actually employs the system to make decisions.
   ii) The intermediary who assist the manager to learn the system.
   iii) A DSS builder who employs a generator to build a specific DSS for the given end-user. He must be familiar with the business problems and the capabilities of the generator.
   iv) The technical support specialists who install and maintains various modules of the generator package as needed. He ensures that there are linkages to other element such as databases, personal workstation and the network.
   v) A tool smith who develops the building blocks employed by the generator.

Comparison of DSS and MIS

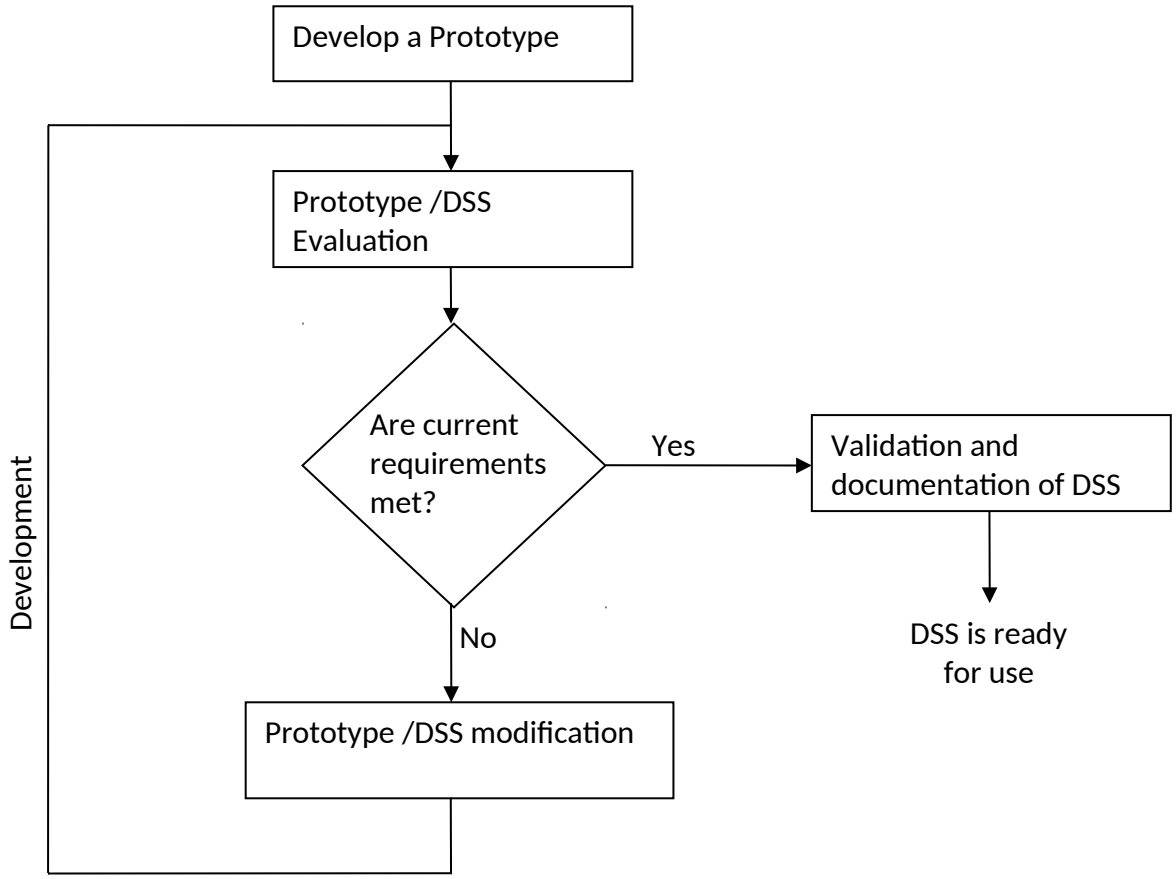
	DSS	**MIS**
1.	A DSS is more targeted.	An MIS is more widely spread
2.	They focus on specific decisions	They use routine flows of data to assist in the general control.
3.	They are aimed at all managers	They are largely dominated by professional e.g. accountants and HR experts.
4.	They are continuously interactive	They follow a particular system development methodology.

Methods of DSS Development

1. Quick-hit approach
   Most DSS are built for personal use of a decision maker using a DSS system such as spreadsheet package with templates. This method faces the same risks as those of end-user computing e.g. lack of maintainability.
2. Traditional life cycle development.

This involves detailed system planning, analysis, design, coding, testing and implementing. This method is good for complex D.S.S. and D.S.S generator.

3. Iterative development (prototyping).
   In DSS development users may not know what they what from the system. A prototype, which is a simple initial version, is used to experiment with and learn about the desired features of the system. This method of development relies on the creation of such a prototype and its progressive refinement. The simple version consist of 3 elements i.e. the Database. The dialogue and the model sub systems.



Geographical Information System (G.I.S)

This is a special category of D.S.S that can handle and analyze data for planning and decision making using digitized maps. The software can assemble, store, manipulate, and display geographically referenced information, time data to points, lines and areas of a map.

They support decisions that require knowledge about the geographical distribution of people or other resources which are useful in planning e.g.

1. Where to locate ATM in towns and cities.
2. Where to locate petrol stations.
3. To know market and know where to emphasis in marketing.
4. Depots and distributions points.

Web-Based Decisions Support System

These are systems that support decision making by providing online access to various databases and information pools for the purposes of software analysis “handouts later”

GROUP DSS (GDSS)

It’s an interactive computer based system to facilitate the solutions of unstructured problems by a set of decision makers, working together as a group. It includes web based tools for radio conferencing and E-meetings.

They help to share information, exchange ideas and export alternative solutions with the use of models and data, voting and consensus.

The settings for a DSS range from a face to face meeting or an executive planning group who are widely dispensed e.g. Insurance company agents discussing the possibility of new rates.

A typical GDSS should include the following:-

1. HARDWARE:- Conferences facility with a room, facilitates and electronic hardware such as electronic display boards, audiovisual equipment, computer and networking equipment.
2. PEOPLE – Needs participants, a trained facilitator and the staff that support the hardware and software.
3. SOFTWARE TOOLS – such as;
    a) Electronic questionnaires – assist the organizers in planning and identifying areas of concern from the participants.
    b) Electronic brain-storming tools – they allow individuals to simultaneously and anonymously contribute ideas and eventually choose the most appropriate.
    c) Idea organizer – facilitate the organized integration and synthesis of ideas generated during brain-storming.
    d) Tools for voting or setting priorities – help in simple voting and ranking the decision.
    e) Group Dictionaries – document group agreement in the definition of words and terms used in a project.

Characteristics of GDSS

1. They have the 3 major components i.e. databases, models and dialogue sub-system and communication component or a local area network or WAN.
2. It has a complete decision room equipped for group effort e.g. a large common screen display.
3. The participating members of the group remain anonymous.
4. Have the ability to obtain protocols or rules of accessing ideas for later analysis.

How GDSS Can Enhance Group Decision Making

1. Improves the pre-planning process.

2. Increases the participation of members as they contribute simultaneously.
3. Due to fact that members are anonymous the meeting atmosphere is conducive.
4. Its free of criticism due to the reduction of unproductive inter-personal conflicts.
5. Idea organization and evaluation are used to modify the results.
6. Documentation of meeting and preservation of organizational memory.
7. Access to external information.

Executive Information System /Executive Support System (E.S.S)

These are information system at the strategic level to address the non-structured decision making through advanced graphics and communication. It combines internal and external data to create a generalized computing and communications environment and thereby assist the senior executives monitor the organization performance, tracks the activities of competitors, spot problems, identity opportunities and focus trends.

ROLE OF E.I.S:

1. Executive are bound to receive fixed formats of reports e.g. weekly or monthly which can easily lead to data over-load.
   EIS solves the problem by supplying easy to use desktop analytical tools and online data displays. These tools help to drill down the information i.e. being able to more from summarizes to the details.
2. Provide managers with minimum computers experience with a common user friendly software tool e.g. a spreadsheet for analytical purposes.
3. To solve the limitation of having to use data from systems designed for different purposes e.g. data from a sales TPS should provide essential information for marketing purposes.
4. Provide managers with external data e.g. current stock market news, industry trends and competitor information. These data can be illustrated as follows:-

No.	Area	Historical 2017	Current 2018	Forecast 2019
1.	Overall performance			
	Total sales	√	√	√
	Total costs	√	√	√
2.	Summarized financial data			
	- Sales by	√	√	√
	division, by product, by	√	√	√
	customer cost by category,	X	√	√
	product cash flow			
3.	External data			
	Economic trends		√	√

	Industry trends Competitive analysis Consumer analysis		√ √ √	√ √ √
4.	Personnel Performance data Availability of key personnel	√	√ √	√ √
5.	Project status and promotional plans		√	√

Characteristics of E.I.S

- They provide immediate and easy access to information reflecting the key success factors of the company and its subsidiaries.
- They use user-seductive interface e.g. color graphics and video which help the user to grasp trends at a glance.
- Provide access to a variety of databases both from internal and external sources through a uniform standard interface.
- Provide both the current status and the projection of data.
- Allow easy tailoring to the preferences of a particular user or group of users e.g. Windows XP.
- They have the capabilities of drilling down the data.
- They create a generalized computing and communication environment rather than providing any fixed application of a specific capability.
- They are designed to incorporate data about external event. e.g. new tax data on competitors but also use summarized information from the DSS and the MIS.
- They filter/compress and track critical data emphasizing the reduction of time and effort required to obtain executive information.
- Information is the average of internal and external data which are highly summarized.
- The processing involves the production of graphics and simulations whereas the information outputs are projections and responses to the queries of the senior managers.

Developing E.I.S

Executive need change rapidly and so high level executive expect success the first time. This implies that the developers of E.I.S must consider the following:-

1. Using prototyping techniques to develop a user-friendly system.
2. Including a facility for environmental scanning that uses internal and external data to detect problems in organizational environment, strategic trends and opportunities.

3. Developing a system that is going to neutralize resistance that is likely to occur due to the E.I.S potential of giving top executives the capabilities of examining manager's work without their knowledge.
4. Developing a system whose benefits can be quantified after it becomes operational. This is because there is a problem of justifying the cost of a system that primarily supports unstructured work.

Elements of a successful E.I.S

1. Standard Reports – the ability to navigate easily via large amounts of data. This can include text, reports, numerical table and projects status reports e.g. Gantt Charts, PERT and network analysis.
2. Drill-down capabilities:-
3. Short term issues: Ability to set and delete issues very quickly without the help of I.T staff.
4. Exceptional reporting capabilities.
5. Executive briefing: Manager should be able to select screens of data, text or graphs and download them to a standard workstation for later review and preservation at meetings.
6. External data – Most businesses have sources of specific industry data that is important for the operation of the data. The E.I.S is able to filter this key information.
7. News – News delivered electronically should be more current and focused that those via the print media.
8. Data analysis – This should include abroad range of functionalities from a simple calculation to sophisticated modeling software.
9. Executive mail – This allows managers to incorporate Emails and attachments with minimum keyboard interactions.
10. Time management – The time management component of an E.I.S should provide a calendar and a suspense file for keeping track of important dates and timers.
11. Data retrieval – It should provide access to corporate files and databases which are linked to public databases.

Benefits associated with E.I.S

1. Help to save the staff and executive time.
2. Help executive improve their understanding of the company and its environment.
3. They eliminate communication bottlenecks between the staffs, the management and the executives which can show down the decision making process.
4. They provide executive with summarized and custom tailored data.
5. Their ability to analyze, compare and highlight trends ensure clearer and up to-date information.

6. Flexibility in their use in that they put the data and the tool in the hands of executives without addressing specific problems or imposing solutions.

Problems Associated With E.I.S

1. The executive success failure will have a major impact on organization.
2. Line and staff managers are uncomfortable with executive access to detailed operational data especially if they have no time to do their own analysis before the executive can access the data.
   This may lead to situations where some data may be withheld from the databases.
3. Using an E.I.S may not be compatible with the management styles of making executives used to working via others.

What is decision making?

Decision making is an integral part of management and occurs in every function and at all levels. Naturally the type of decisions taken varies enormously but all decision makers have to go through a similar process. All of them must decide by some means to choose the outcome or outcomes which are considered necessary or desirable to them and to do so after some form of appraisal of the situation.

H.A. Simon, a leading authority on management decision making, considers that decision making comprises four principal phases: finding occasions for making decisions, finding possible courses of action (i.e. alternatives), choosing among courses of action, and evaluating past choices.

Figure shows a summary of these phases using Simon's terminology

Phase 1	Intelligence	Searching the environment for conditions calling for decisions.
Phase 2	Design	Inventing, developing and analyzing possible courses of action. This involves processes to understand the problem, to generate solutions and the testing of solution for feasibility.
Phase 3	Choice	Selecting an alternative or course of action from those available. A choice is made and implemented.
Phase 4	Review	Assessing past choices.

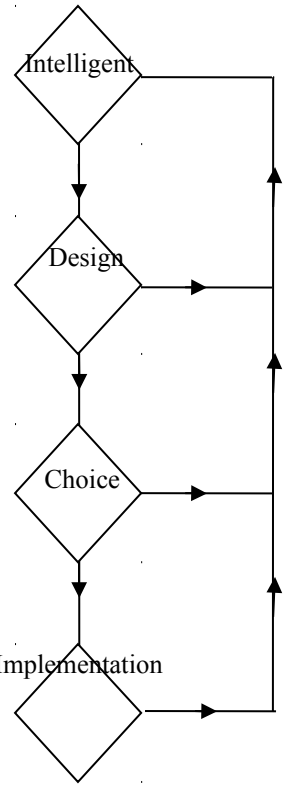
It is important to realize that although there is a general flow from intelligence to design to choice to review, at any time there could be a return to an earlier phase. For example, a decision maker in the choice phase, who finds no suitable alternative among those currently available, would return to the design phase to develop more alternatives. Decision making is an iterative process and although it is useful to separate out the various phases

in order to discuss them, very few decisions are taken in this neat, logical sequence. There is feedback/ interrelationships between decisions; there is flair, intuition, judgment and creativity.

Decision making is based on information. Information is the trigger to knowing there is a problem. Information is needed to define and structure the problem, to explore and choose between the alternative solutions and to review the effects of the implemented choice.

Simons model of decision making

1. Is there a problem?
2. What are the alternatives?
3. Which should you choose?
4. Is the choice working



Individuals collect information to identify problems or opportunities. This requires exceptional reporting and uses MRS & TPS.

As you design you may make use of simulation and prototyping which utilizes DSS and KWS

This require "what if" simulation and uses DSS and other large models.

The decision is put into effect and reports on progress this requires graphics and charts.

Programmed and non-programmed decisions

Simon classified decisions into two categories according to the extent that the process of decision making can be pre-planned. The categories are programmed and non-programmed, as follows;

- **Programmed decisions**

  Characteristics: repetitive, routine, known decision rules or procedures, often automated, usually involve 'things' rather than people, can be delegated to low levels in the organization. Examples: inventory control decisions, machine loading decisions, scheduling.

- **Non-programmed decisions**

  Characteristics: novel, non-routine, decision rules not known, high degree of uncertainty, cannot be delegated to low levels, may involve 'things' but always involve people. Examples: acquisitions, mergers, launching new products, personnel appointments.

- **Semi-structured decisions.**

  These decisions are partly programmable and partly rely on decision maker judgment.

Note: alternative terms for these two categories are *structured* and *unstructured*.

The two categories should be thought of as the extreme ends of a range of decision types with many decisions containing elements of both categories. The terms programmed and non-programmed are not related to computer processing. They refer to the nature of the decision process and to the extent that the process can be pre-planned.

There is some relationship between the level of management and the decision type: broadly more programmed decisions at lower levels and more unstructured decisions at higher levels, but this is not an absolute rule. Some high level decisions contain structured elements, an example being a costly plant replacement decision which is likely to be taken at the highest level and for which decision rules are available using replacement analysis and investment appraisal techniques.

Levels of decision making

Decision making takes place at each level of management in an organization although there are markedly different characteristics at each level. Each level has substantially different information requirements. The figure below summarizes the main characteristics and information requirements of the various levels.

Management level	Decision characteristics	Information characteristics
Strategic	Long time horizons, large-scale resources, much creativity and judgment, usually unstructured, problems difficult to define, infrequent, much uncertainty	Largely external, informal sources important, forward looking, qualitative information important, precision unimportant, instant access not vital, wide ranging, incomplete
	↕	↕
Tactical	Repetitive, short time scale, small-scale resources, usually structured, clear objectives and decision rules, little or no discretion	Largely internal, mainly historical, detailed, often quantitative, high precision, instant availability often critical, narrow in scope, comprehensive
Operational		

The tactical level of management occupies an intermediate position between the two extremes with some of the characteristics of both. Much of the development of formal aids to decision making, such as,, for example, optimizing models has been directed at the operational and tactical levels of management. At the strategic level,

decision making is much more dependent on human factors and judgment. Such decision making is based on guided trial and error and because of uncertainty and ambiguities, all possibilities cannot be explored. This type of decision making is known as heuristic and is based on rules of thumb rather than explicit decision rules.

Figure below gives examples of decision making at the three levels with typical information requirements.
In practice, decisions should be taken at the level where they are most effective.

Management level	**Decision examples**	**Information requirements**
Strategic	Mergers and acquisitions, new product planning, capital investments, financial structuring.	Market and economic forecasts, political and social trends, legislative, environmental and technological constraints and opportunities
Tactical	Pricing, capacity planning, budget preparation, purchasing contracts.	Cost and sales analyses, performance measures, summaries of operations/production, budget/actual comparisons, etc.
Operational	Production scheduling, maintenance, reordering, credit approval.	Sales orders, production requirements, performance measures, customer credit status, deliveries, dispatches, etc.

Peter Drucker says decisions should be made at the lowest possible level which accords with their nature, and as close to the scene of action as possible. They should always be taken at the level which ensures none of the activities and objectives affected is forgotten.
There is increasing evidence that many decisions are being taken at lower levels in the hierarchy. Authority to take decisions is being delegated down the line/ especially in modern service industries. This process is called empowerment and means that the organization is able to answer queries and take a variety of decisions more quickly thus providing a better and more flexible service. Empowerment is also one of the reasons why some middle management jobs are disappearing.

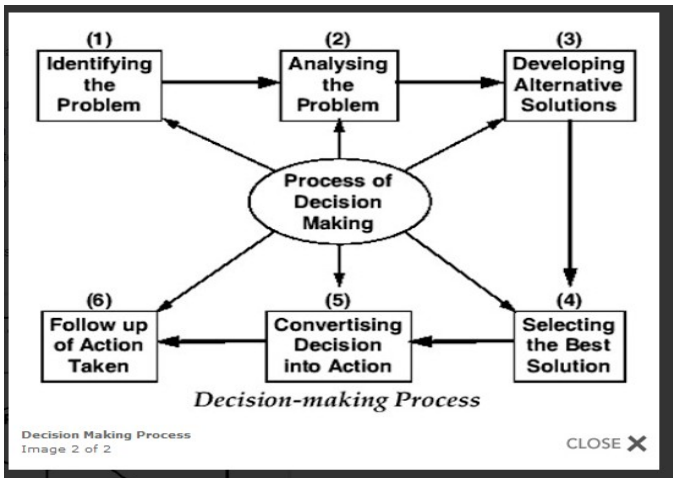
Decision making cycle

Steps Involved In Decision Making Process

Decision-making involves a number of steps which need to be taken in a logical manner. This is treated as a rational or scientific 'decision-making process' which is lengthy and time consuming. Such lengthy process needs to be followed in order to take rational/scientific/result oriented decisions. Decision-making process prescribes some rules and guidelines as to how a decision should be taken / made. This involves many steps

logically arranged. It was Peter Drucker who first strongly advocated the scientific method of decision-making in his world famous book 'The Practice of Management' published in 1955. Drucker recommended the scientific method of decision-making which, according to him, involves the following six steps:

1. Defining / Identifying the managerial problem,
2. Analyzing the problem,
3. Developing alternative solutions,
4. Selecting the best solution out of the available alternatives,
5. Converting the decision into action, and
6. Ensuring feedback for follow-up.



1. Identifying the Problem: Identification of the real problem before a business enterprise is the first step in the process of decision-making. It is rightly said that a problem well-defined is a problem half-solved. Information relevant to the problem should be gathered so that critical analysis of the problem is possible. This is how the problem can be diagnosed. Clear distinction should be made between the problem and the symptoms which may cloud the real issue. In brief, the manager should search the 'critical factor' at work. It is the point at which the choice applies. Similarly, while diagnosing the real problem the manager should consider causes and find out whether they are controllable or uncontrollable.
2. Analyzing the Problem: After defining the problem, the next step in the decision-making process is to analyze the problem in depth. This is necessary to classify the problem in order to know who must take the decision and who must be informed about the decision taken. Here, the following four factors should be kept in mind:

- Futurity of the decision,
- The scope of its impact,
- Number of qualitative considerations involved, and

- Uniqueness of the decision.

3. Collecting Relevant Data: After defining the problem and analyzing its nature, the next step is to obtain the relevant information/ data about it. There is information flood in the business world due to new developments in the field of information technology. All available information should be utilized fully for analysis of the problem. This brings clarity to all aspects of the problem.
4. Developing Alternative Solutions: After the problem has been defined, diagnosed on the basis of relevant information, the manager has to determine available alternative courses of action that could be used to solve the problem at hand. Only realistic alternatives should be considered. It is equally important to take into account time and cost constraints and psychological barriers that will restrict that number of alternatives. If necessary, group participation techniques may be used while developing alternative solutions as depending on one solution is undesirable.
5. Selecting the Best Solution: After preparing alternative solutions, the next step in the decision-making process is to select an alternative that seems to be most rational for solving the problem. The alternative thus selected must be communicated to those who are likely to be affected by it. Acceptance of the decision by group members is always desirable and useful for its effective implementation.
6. Converting Decision into Action: After the selection of the best decision, the next step is to convert the selected decision into an effective action. Without such action, the decision will remain merely a declaration of good intentions. Here, the manager has to convert 'his decision into 'their decision' through his leadership. For this, the subordinates should be taken in confidence and they should be convinced about the correctness of the decision. Thereafter, the manager has to take follow-up steps for the execution of decision taken.
7. Ensuring Feedback: Feedback is the last step in the decision-making process. Here, the manager has to make built-in arrangements to ensure feedback for continuously testing actual developments against the expectations. It is like checking the effectiveness of follow-up measures. Feedback is possible in the form of organized information, reports and personal observations. Feed back is necessary to decide whether the decision already taken should be continued or be modified in the light of changed conditions.

CHAPTER 3
MANAGEMENT OF INFORMATION SYSTEM RESOURCES

CONCEPTS OF INFORMATION RESOURCE MANAGEMENT (IRM)

The term "Information Resources" incorporates three broad categories of "information stuff" essential to the modern business enterprise: the large mass of stored data (DATA); the huge volume of application system program code (APPLICATION SOFTWARE); and the numerous networked hardware components, along with the operating programming that makes it all work (TECHNOLOGY). These three components, working together, allow the enterprise to produce and use the information required to effectively operate, compete, and manage on a daily basis. The information resources of most large enterprises represent a significant cost factor, yet interestingly, most enterprises do not manage these critical and expensive resources like they do all other resources. All of the "Big Five" resources (human, financial, equipment, material, and facilities) have very effective management discipline, based on several universal resource management principles:

- Responsibility and authority must be clearly designated to manage the limited resource on behalf of the enterprise.
- The resource is not free; limitations must be recognized, and managed so there is enough when and where needed, but waste and unused excess are costly mistakes.
- The resource must be controlled, and allocated so it is available when and where needed, and should serve the highest priorities first.
- The resource must be constantly tracked: the enterprise must always know how much of the resource it has, where it is located, what condition it is in, how to access it when needed, etc.
- The resource must be properly stored and maintained so that it is ready and usable when needed.
- The resource must be forecast - the enterprise must think and plan ahead to ensure it will have adequate supply of the resource when needed.

So, the term "Information Resource Management" simply means changing the way typical IS/IT is implemented within the enterprise, so that it manages the *information resources (DATA, APPLICATION SOFTWARE, and TECHNOLOGY)* like any other enterprise resource - the principles of how to properly and effectively manage it are exactly the same.

The enterprise must establish effective management control of the data resource, or it will never fully achieve the payoff: faster, cheaper, better business operations, and significantly greater business flexibility, innovation, and change. Data Resource Management (DRM) is a critical part of the IRM environment.

Most enterprises today are critically dependent upon automated information for both daily operation and management control. Today, information is the most important and highest-leveraged resource the enterprise controls -- *the means by which all other resources are managed*. Yet, few businesses have begun to exploit the enormous strategic potential of a well-integrated information environment. Most enterprises function at a small fraction of their potential productivity with a set of terribly disintegrated, inconsistent, and often redundant application systems, operating on an underlying redundant, inconsistent, and untimely data mess. The main obstacles to exploiting the information resource are internal to the enterprise, and can be easily overcome - it is truly a common sense proposition.

This informational (not skill-building) seminar targets senior management of the enterprise, and strikingly contrasts the way we currently manage enterprise resources (human, financial, material, equipment, and facilities), and the vastly different way we currently (mis)manage *information resources* of the enterprise. The seminar also contrasts the IRM environment with the traditional "disintegrated application systems" environment embraced by most enterprises today, and shows exactly how and why the IRM approach solves the problems inherent in the "dis-integrated systems" approach. It shows how simple application of well-recognized, time-proven, routinely-practiced management discipline to this stuff called "information" will remedy the massive information messes so prominent today. An integrated information environment is a strategic necessity today, and is not the result of accident nor random motion. The react-mode IS/IT Organization within the enterprise today must be empowered to carefully plan, model, build/acquire, and maintain this integrated information environment, not to just react to immediate need of the moment. The need for the enterprise to change rapidly and affordably and the accelerating rate of change in computer technology makes IRM not only a proactive, but a defensive necessity in today's economy. *Ironically, any business or government agency today would function significantly faster, cheaper, better, and more flexibly using less than 10% of the stored data that they currently attempt to manage, less than 10% of the existing program code they've bought/built, and a fraction of the computer technology (hardware and operating software) they currently manage. Integration means shaking it all down, pressing it together.*

One of the dilemmas facing today's manager is that on the one hand they seem to be suffering from information overload, yet on other hand, they often complain about shortage of information needed to make vital decisions.

Symptoms of overload are a growth of incoming information, including electronic mail, an explosion in the volume of information sources. Symptoms of scarcity are the lack of vital information for decision making, unexpected competitor moves and the inability to find the relevant 'needle in the haystack'

There is also the crucial problem of exploiting an organization’s proprietary information as a strategic asset.

Underlying these problems is that of having "the right information, in the right place, in the right format, at the right time".

What is the Solution?

Partial solutions include Executive Information Systems (EIS), On-line and CD-ROM data-bases, alerting services. A more encompassing solution is to adopt the principles of Information Resources Management (IRM) (not to be confused with an information management or information systems). Whereas the value (often declining!) of tangible assets, such as property and office equipment, is regularly assessed and audited, similar processes are lacking for intangible assets, such as information and knowledge, whose asset value is increasing in many organizations.

Information Resources Management (IRM) is an emerging discipline that helps managers assess and exploit their information assets for business development. It draws on the techniques of information science (libraries) and information systems (IT related). It's an important foundation for knowledge management, in that it deals systematically with explicit knowledge. Knowledge centers often play an important part in introducing IRM into an organization.

The five key activities for effective IRM management:

- Identification what information is there? How is it identified and coded?
- Ownership- who is responsible for different information entities and co-ordination?
- Cost and Value A basic model for making judgments on purchase and use
- Development increasing its value or stimulating demand.
- Exploitation Proactive maximization of value for money.

Information Systems Resources (ISR) enables the use of information systems in administrative functions so that those functions may be conducted in the most effective way possible.

Information Systems Resources includes Networks, Hardware, Software, Data & People

What are the resources an information system needs?

Discover how networks, hardware, software, data and people work together to create usable information.

Understanding Data

We've established that an **information system** is the combining of users, technology and processes to complete a specific goal. A stakeholder isn't only a user but is someone who has any type of interest in a particular process. These people utilize hardware and software, typically in a network format, to process raw data into usable information.

Data is one piece of a record. Individually, some of your datum might be your first name, middle name, last name, address, city, state, zip, phone number and occupation. When put together, we see a **record**.

Hardware and Peripherals

The components of the system you can physically touch - the system unit (tower, desktop, laptop), internal devices and peripheral devices (keyboards and monitors) - are called **hardware**.

Specifics of **peripheral devices** are provided in many other ways, but think of them as hardware that surrounds the system unit.

Importance of managing ISR

Few organizations have developed a comprehensive IRM strategy. Those that have started with some of its key processes of **information audit**, and **information mapping** cite the following benefits:

- Identifies gaps and duplication of information
- Clarifies roles and responsibilities of owners and users of information
- Provide costs saving in the procurement and handling of information
- Identifies cost/benefits of different information resources
- Actively supports management decision processes with quality information

Some of the issues that it addresses are:

Strategic - the information needs to support the implementation of business strategies; also the way that information itself can be a key lever of strategy (in terms of new product and service opportunities)

Organizational - ownership, evaluation, fragmentation, isolation from processes, the politics of information

Structural Integrating external and internal information, its categorization, refining it from data into classified actionable 'chunks'.

Systems User accessibility, interface to sources, multiple databases, retrieval, usability

Human Processing capability, overload incentives to share.

How to Manage Information as a Strategic Asset

4. **Understand the role of Information.**

Information can add value to your products and services. Improved information flows can improve the quality of decision making and internal operations. Yet many managers do not fully understand the real impact of

information – the cost of a lost opportunity, of a poor product, of a strategic mistake – all risks that can be reduced by using the appropriate information.

5. **Assign Responsibility for Leading your IRM Initiative.**

Developing value from information resources is often a responsibility that falls between the cracks of several departments – the user departments in different business units, and corporate planning, MIS units or librarians..

6. **Develop Clear Policies on Information Resources**

Develop policies for ascertaining information needs, acquiring and managing information *throughout its life cycle.* Pay particular attention to ownership, information integrity and sharing. Make the policies consistent with your organizational culture.

4. Conduct an Information Audit (Knowledge Inventory).

Identify current knowledge and information resources (or entities), their users, usage and importance. Identify sources, cost and value. Classify information and knowledge by its key attributes. Develop knowledge maps.

5. Link to Management Processes.

Make sure that key decision and business process are supported with high leverage information. Assess each process for its information needs.

6. Systematic scanning.

Systematically scan your business environment. This includes the wider environment - legal and regulatory, political, social, economic and technological - as well as the inner environment of your industry, markets, customers and competitors. Provide selective and tailored dissemination of vital signs to key executives. This goes beyond the daily abstracting service provided by many suppliers.

7. Mix hard/soft, internal/external.

True patterns and insights emerge when internal and external data is juxtaposed, when hard data is evaluated against qualitative analysis.

7. Optimize your information purchases.

You don't have to ***control*** purchasing, but most organizations do not know how much they are really spending on external information.

8. Introduce mining and refining processes.

Good information management involves 'data mining', 'information refining' and 'knowledge editing'. You can use technology such as intelligent agents, to help, but ultimately subject matter experts are needed to repackage relevant material in a user friendly format. One useful technique is content analysis, whose methods has been developed by Trend Monitor International in their Information Refinery, and is used in the analysis of services. The classifying, synthesizing and refining of information combines the crafts of the information scientist,

librarian, and business analyst and market researcher/analyst. Yet many organizations do not integrate these disciplines.

9. Develop Appropriate Technological Systems

Continual advances in technology increase the opportunities available for competitive advantage through effective information management. In particular, intranets, groupware and other collaborative technologies make it possible for more widespread sharing and collaborative use of information. Advances in text retrieval, document management and a host of other trends in knowledge management technologies have all created new opportunities for providers and users alike.

10. Exploit technology convergence.

Telecommunications, office systems, publishing, documentation are converging. Exploit this convergence through open networking, using facilities such as the World Wide Web, not just for external information dissemination but for sharing information internally.

11. Encourage a Sharing Culture

Information acquires value when turned into intelligence. Market Intelligence Systems (MkIS) are human expert-centered. Raw information needs interpretation, discussing and analyzing teams of experts, offering different perspectives.

Information as a resource

Traditionally the following 3 factors can be termed as essential in any economy:-

1. Human Resource (labor)
2. Finance (capital)
3. Raw materials

Over the past 2 decades information has come to be recognized as another factor of production. Businesses require information about their competitors, their suppliers, customers and standard and market trends. Information is a resource on its own, as well as an asset to other.

It falls within the resource hierarchy which starts with date, which leads to information, coming together as knowledge and resulting in wisdom.

The final step is the integration of the knowledge into wisdom, which is information which has been made useful by theory relating the bits of knowledge to each other.

There are 6 characteristics of information as a resource:-

1. **Information is expandable:**

Its recognized that for specific purposes information may wear out but in general the more we have, the more we use and the more useful it becomes.

2. **Information is compressible**
   It's possible to concentrate, integrate and summarize information for easier handling.

3. **Information is substitutable**
   Information can and does replace hand, labor and capital. It's the use of computers and telecommunication that aids in these phenomena.

4. **Information is transportable**
   Information can be tapped into just about anywhere, this has led to the idea of being remote as much more difficult to achieve since people and information can e taken to the remotest of places.

5. **Information is diffusive**
   These are the ability to information leek. This leakage allows us to have more and more of us to have it.

6. **Information is shareable**
   No exchange transaction of information can take place, only sharing transactions and this leads to an entire sharing environment.

Information Society

Definition;

An **information society** is a society where the creation, distribution, uses, integration and manipulation of information is a significant economic, political, and cultural activity. The aim of the information society is to gain competitive advantage internationally, through using information technology (IT) in a creative and productive way. The **knowledge economy** is its economic counterpart, whereby wealth is created through the economic exploitation of understanding. People who have the means to partake in this form of society are sometimes called digital citizens. This is one of many dozen labels that have been identified to suggest that humans are entering a new phase of society.

The markers of this rapid change may be technological, economic, occupational, spatial, cultural, or some combination of all of these. Information society is seen as the successor to industrial society.

The characteristics of information societies

Information societies have three main characteristics.

1. **Information is used as an economic resource**. Organizations make greater use of information to increase their efficiency, to stimulate innovation and to increase their effectiveness and competitive position, often through improvements in the quality of the goods and services that they produce. There is also a trend towards the development of more information- intensive organizations that add greater amounts of value and thus benefit a country's overall economy.

2**. It is possible to identify greater use of information among the general public**. People use information more intensively in their activities as consumers: to inform their choices between different products, to explore their entitlements to public services, and to take greater control over their own lives. They also use information as citizens to exercise their civil rights and responsibilities. In addition, information systems are being developed that will greatly extend public access to educational and cultural provision.

3. The development of an information sector within the economy. The function of the information sector is to satisfy the general demand for information facilities and services. A significant part of the sector is concerned with the technological infrastructure: the networks of telecommunications and computers.

Increasingly, however, the necessity is also being recognized to develop the industry generating the information that flows around the networks: the information-content providers. In nearly all information societies, this information sector is growing much faster than the overall economy.

The creation of individual information societies is taking place within a much greater, international process of change. Partly this is because the developing information systems are global, or at least international, in their reach: satellite broadcasting systems do not recognize national boundaries; telecommunication networks provide connections between countries and continents, while the Internet is perhaps the ultimate example of a global system.

Both developed and developing countries are being transformed into information societies. Most of them are concerned to use information to improve their relative competitiveness or, at least, to retain their position in an increasingly competitive global market. The development of information societies represents a series of attempts to achieve more general economic and social advance.

There is a concern, however, that the shift towards information societies will increase the gap between the developed and the developing countries. To counter this, the World Bank has recently launched its Information for Development initiative.

Challenges of Information societies

Methodological issues: defining and measuring the information society

- It is proving very difficult to define and describe in quantitative terms information **societies.** We have seen that it is possible to identify some common characteristics of information societies, but it is not at all easy to go beyond generalized definitions, such as: an information society is one in which information is used intensively as an aspect of economic, social, cultural and political life. This presents a major problem for statisticians who have to collect the data that governments need for economic management.
- It is more difficult, however, to **define and measure the information activity** that takes place within organizations outside the information sector.
- The matter is further complicated by the **intangible nature** of information. It is a good that does not easily fit into the economists' scheme of things. Its value can vary widely, particularly over time, which makes it very difficult for accountants to value it for company balance sheets. Also, the value of information, unlike most other goods, does not decrease as it is consumed; indeed, the value may increase as one piece of information is added to others.
- The **globalization** of the information sector poses further problems. Someone working in Africa can use the Internet to obtain information about a firm operating in Europe that has been compiled by an American-owned information company based in Switzerland using a database that was compiled by Eurostat, the statistical arm of the European Commission. Who regulates the information? Under which set of laws is it collected, compiled, delivered and consumed. If the user has to pay for the information, where does the revenue go? Which governments are entitled to levy a sales tax on the information? To which set of national accounts should the financial transactions be credited? It is possible to arrive at answers to most of these questions, but in doing so we raise further questions about the ability of our economic and statistical systems to cope with the changes that are taking place.

CHAPTER 4

INFORMATION SYSTEMS PLANNING

Planning is primary management function which is a process of setting objectives for the future and lay out the action necessary to reach those objectives. A plan is a specific statement of objectives and gives the links by which a firm aims to achieve this.

Many plans that are drawn up by managers are either financial, personnel or production in nature. Planning can be strategic, tactical or operational.

Planning and controlling are related:-

1. Strategic Planning;

The purpose of this planning is to develop long-term objectives for the entire organization and for its major business units and more so to specify the general strategies for acquisition of resources needed to accomplish these objectives.

It includes the following:-

a) The establishment of broad long-term objectives for an enterprise.
b) Accessing the company's current position relative to these objectives and in particular considering the threats and opportunities provided by the environment.
c) Considering alternative strategies for reaching the objectives in the competitive business environment.
d) Outlining the organizational structure and the total resources needed to implement the plan.
e) The planning for the implementation process.

The MIS strategic plan includes:-

ii) Statement of the objectives to be achieved.
iii) Projection of the future MIS environment.
iv) Projection of the future user environment.
v) Projection of the future industry environment.
vi) Definition and evaluation of strategic alternatives in relation to the organization strategic plan and the selection of the preferred alternative.
vii) The establishment of the required infrastructure plans and the personnel requirements.
viii) The plan for the organizational structure of the MIS department.
ix) A detailed financial plan indicating the benefit and the cost to be incurred.
x) The plan for the implementation of the strategic plan.

2. Tactical and Operational Planning

This involves the prioritizing and laying out in detail the acquisition of hardware, software and telecommunication equipment. This planning is expressed in terms of the budgets which specify the resources committed to a given plan for a given project or time period. Budgets can be fixed or flexible, and an organization can use spreadsheet as the main budgeting tool.

Planning can be TOP-DOWNS whereby the process starts with the senior management. This may ignore what is going on at the bottom.
It can also be BOTTOM-UP where the junior staffs are encouraged to come up with their own departmental plans. However this may not align well with the strategic objectives of the organization.

The role that information systems play in the planning process is to be used in developing plans such as forecasting and identifying and comparing alternative causes of action. There is need therefore to make use of financial ratios to justify our various plans.

FINANCIAL RATIOS:

Information System Project Manager Technique

Planned financial projections produce ratios that indicate the performance of the business unit. They include;-

1. Payback method
2. Net present Value (NPV)
3. Internal Rate of Return (IRR)
4. Accounting Rate of Return (ARR) or Return on Investment (R.O.N)
5. Cost benefit ratio
6. Profitability Index etc.

These are used to justify new systems, explain old systems and to develop quantitative support for the adoption of various alternatives. The major limitation is to assume that all the relevant alternatives have been examined and that all cost and benefits are known. However in quantifying these in monetary terms, there are needed to classify whether the cost and benefits are tangible or intangible.

a) Pay Back Method

These measures the time required to pay back the initial investment of a project. Calculate the payback period for the following project.

Project 1	Project 2	Project 3

Year	Net cash	Unlawful	Net cash	Commutative	Net cash	Cumulative
0	(1500)		(1500)		(1500)	
1	600	(1500)	400	(1500)	300	(1500)
2	500	(900)	500	(1100)	500	(1200)
3	400	(400)	600	(600)	400	(700)
4		(0)		0	300	(300)
5					300	0
6					300	300
						600

Advantages

1. It's simple to calculate and understand.
2. It uses the project cash flow rather than the accounting profit and hence its more objectively used.
3. It favors quick return projects which may produce faster growth for the company and enhance liquidity.
4. Tends to minimize the risks to a company related to time.

Disadvantages

1. It ignores the time value of money.
2. It ignores the cash flows after the payback period.
3. It ignores the profitability of project or system in the long run.

Net Present Value (N.P.V)

This is the amount of money an investment is worth taking into account its cost, earnings and time value of money.

The present value is the value in the current currency of a stream of payments to be received in the future. From the following formula

Future = Present (1 x $\frac{Rate}{100}$) Time

F = P (1 + $\frac{Rate}{100}$)+

Making P the subject of the formula. Equation then becomes

P = $\frac{Future}{(1+\frac{R}{100})^{+¿}}$ = Future x $\frac{1}{(1+\frac{R}{100})^{Time}}$

= Future x Present value factor (Discount factor)

The value of present value factor are available from financial tables although they can directly be manipulated from the formula e.g. considering the interest rate of 10% the values can be determined as illustrated below:-

$$= \frac{1}{\left(1+\frac{10}{100}\right)^t} = \frac{1}{(1+0.1)^t}$$

$$= \frac{1}{(1.1)^t}$$

Time	value
0	1
1	$\frac{1}{(1.1)^1} = 0.909$
2	$\frac{1}{(1.1)^2} = \frac{0.909}{1.1} = 0.826$
3	$\frac{1}{(1.1)^3} = \frac{0.826}{1.1} = 0.751$

Consider the following example; an investment is being considered for which the net cash flow has been estimated as follows (consider the interest rate to be 20%).

Year	Net cash	Discount factor	Present value	
0	(9500)	1.000	(9500)	NNP > 0 → Invest
1	3000	0.833	+249.9	NPV = 0 → Breakeven Points
2	4700	0.694	+3261.8	NPV < 0 → A broad project
3	4800	0.579	+2779.2	
4	3200	0.482	+1542.4	

Advantages of N.P.V

1. It takes into account the time value of money
2. One can easily use the spreadsheet to calculate it.
3. It considers the whole project life and calculate the returns at expected times.

Advantages

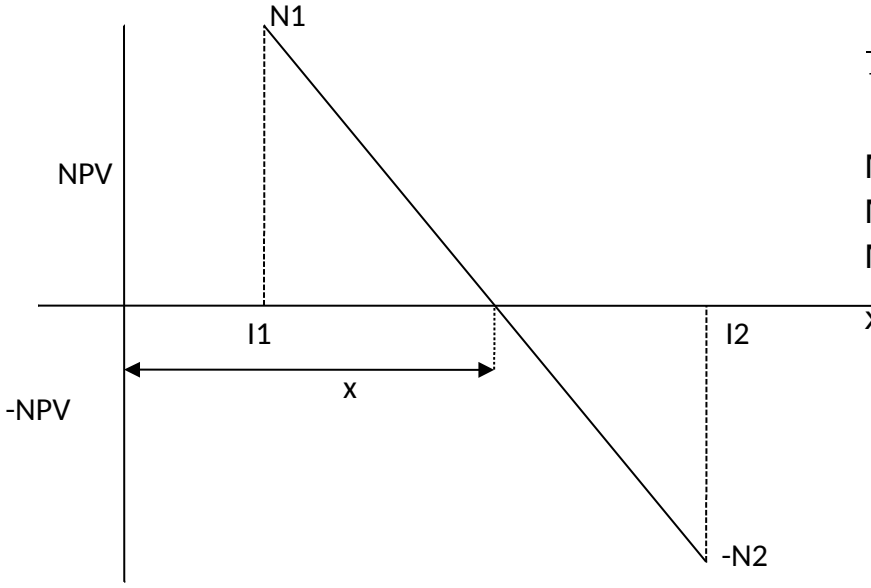
1. It involves estimates of future returns and is thus subject to error.
2. It doesn't set possible targets against which evaluations can be made.

Internal Rate of Return

This is the variation of NPV that takes into account the time values of money. This is the rate of Return on profit that on investment is expected to earn. It's the discount on interest rate that will equate the present value of the project into the future cash flows to the initial cost of the project.

This value can be determined graphically or by interpolation.

$$IRR = \frac{N_1 I_2 - N_2 T_1}{N_1 - N_2}$$



$$\frac{N_1}{-N_2} = \frac{x - I_1}{I_2 - x}$$

$N_1 (I_2 - x) = -N_2 (x - I^1)$
$N_1 I_2 - xN_1 = -N_2 x + N_2 I_1$
$N_1 I_2 - N_2 I_1 = xN_1 x - N_2 x$

$$x = \frac{N_1 I_2 - N_2 I_1}{N_1 - N_2}$$

Consider this example
If $I_1 = 12\%$, $N_1 = 1400$, $I_2 = 15\%$, $N_2 = -700$

$$x = \frac{(1400 x 15) - (-700 x 12)}{1400 - (-700)} = \frac{21000 - (-8400)}{1400 + 700} = \frac{29400}{2100} = 14\%$$

I.R.R = 14%

Accounting Rate Of Return (Return On Investment)

This is the calculation of the Rate of Return in Investment by adjusting the cash inflows produced by the investments for depreciation. It approximates the Accounting income and by the investments.

$$AAR\ (ROI) = \frac{Average\ Income}{Average\ Investment} \times 100\%$$

$$= \left(\frac{Average\ income - Average\ depreciation}{Initial\ Investment} \right) \times 100\%$$

Example:
Mana Company Limited intends to invest in two machines X and Y. Each of the two machines will cost the company 200,000 to purchase and each has an estimated economic life of 10 years after which there will be no residual value. The 2 machines are expected to generate profits as follows;-
NB: The Net returns after tax but before depreciation

YEAR	X	Y
1	40,000	60,000
2	50,000	40,000
3	30,000	50,000
4	10,000	30,000
5	20,000	20,000
6	30,000	18,000
7	15,000	14,000
8	10,000	8,000
9	5,000	3,000
10	30,000	30,000

Total profit before depreciation	240,000	273,000
Less depreciation on a straight line	200,000	200,000
Profits after depreciation	40,000	73,000

Diving by 10 years $\frac{40,000}{10}$ $\frac{73,000}{10}$

Average income = 4,000 7,300

Average investment = $\left(\frac{Initial\ Investment + final\ investment}{2}\right) = \frac{200,000+0}{2}$

= 100,000 = 100,000

ARR = $\frac{4,000}{100,000}$ x 100% $\frac{7300}{100,000}$ x 100%

= 4% = 7.3%

We are going to take project Y sine it has a higher value of percentage.

Example 2

Two Projects A and B with the following capital expenditure

Capital expenditure	75,000	75,000

The following are profits and losses

1	30,000	45,000
2	30,000	6,000
3	20,000	25,000
4	(10,000)	(1,000)
5	(10,000)	13,000

Total profit 60,000 60,000

They are estimated to have a resale value of 5000 each.

Average income = $\frac{60,000}{5}$ (12,000) $\frac{60,000}{5}$ (12,000

Average investment = $\frac{75,000+5,000}{2}$ = 40,000 $\frac{75,000+5,000}{2}$

AAR = $\frac{12,000}{40,000}$ x 100 $\frac{12,000}{40,000}$ x 100

= 30% = 30%

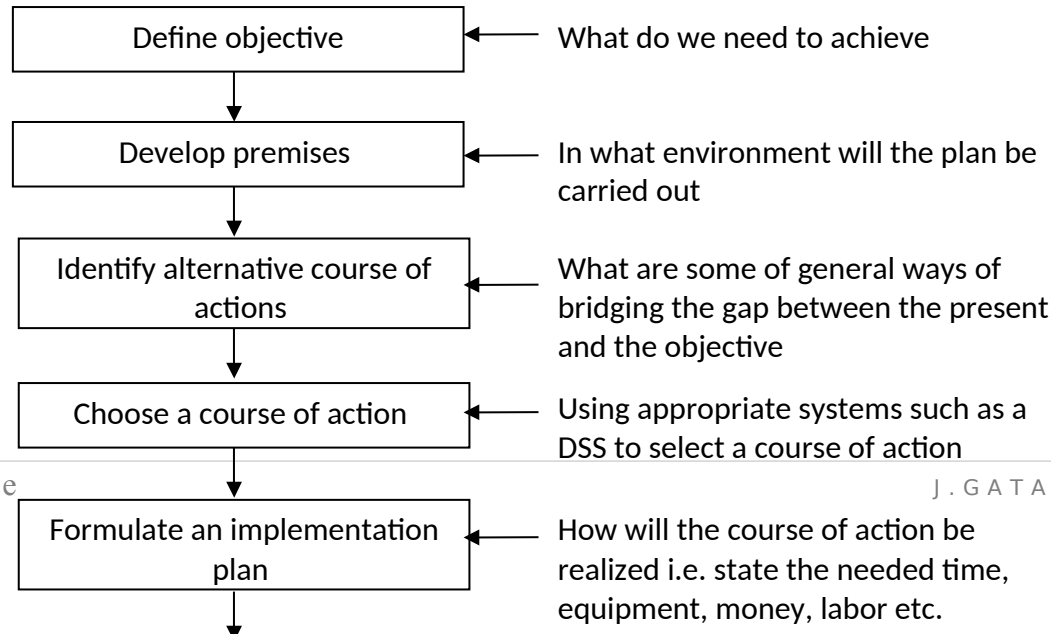
Advantages of ROI/AAR

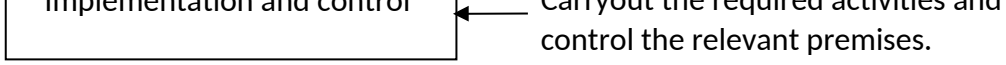
1. Uses available accounting information
2. It's understood by managers

Disadvantages

1. It deals with accounting profits rather than the cash flow.
2. It doesn't take into account the time value of money.
3. For different types of deprecation method doesn't work well e.g. it only works well in straight-line method because the depreciation is constant.

Steps involved in Information system Planning:-





Elements of Good Planning

1. VISION: This is a view of what top management has for organization. It create model that represent what organization would look like and what it will achieve in future environment which it will operate.
2. MISSION: This is the bottom line purpose of organization i.e. what is why it exists.
3. GOALS: These are broad statement of the end results that organization intend to achieve in fulfilling its mission.
4. OBJECTIVE: These are specific and tangible measures of result that organization want to achieve.
5. STRATEGY: A statement on how to reach the vision and achieve the objectives taking care of environment available resources and constraints.
6. CONSENSUS AND COMMITMENT: The leadership must be dedicated to achieving the vision and mission.

Information system planning in a Business

The next major step in planning process is the assessment of the organization from an information management perspective.
During these steps the major processes that are necessary to accomplish the mission successfully are needed to support the process. This can be done by the following:-

a) *Development or validating business system plan*

Business system planning (BSP) methodology was introduced by IBM in 1970s as a way to incorporate information system strategy into business strategy. This methodology has other different name such as Information System Planning (ISP), Information Requirement Studies (IRS).

Functions manager counter praising process of re-engineering will find that performing or updating a business or information system planning studies, provides valuable time saving information that will enhance process re-engineering. The objectives of business system planning are:-

1. To determine information system priorities
2. Plan long level information system based on business process.
3. Manage system resources to support business objective.
4. Assign system resources to high-return projects.

5. Improve relationship between function and technique organization units.

Once the study has been conducted the following would be the benefit:-

1. Coordination of processes re-engineering plans.
2. Assurances that the date and application will be aligned with function process requirements.
3. It will be easier for the plan and resources to synchronize with implementation strategy.

The following task are performed in business system planning

i. Review /validate current business planning system architecture.
ii. Develop the business process or the organization maps.
iii. Prepare or validate information system architecture.
iv. Review and approve business system plan.
v. Identity major business process.

Review /validate current business plan

Many organizations has current business plan that should be reviewed and validated the important that this review take organization model into account.

Identify major business process

Major process can be identified and defined from an enterprise wide perspective independent of process re-engineering effort.

The rules of identifying process include;-

i) Processes are independent of organization structures.
ii) Processes are significant to the nature and purpose of enterprise.
iii) The naming convention for process are verb-name for e.g. Design-project, provide spare parts.
iv) Process redundancy is to be avoided.

Develop process plan/organization matrix

This is a chart or map that show the relationship between the business process sand various organization department.

Functional client process	Plan	Engineer	Construct	Operate

	division	division	division	division
Conduct study	D			
Plan project	D	M	M	
Design project	M	D	M	
Construct project		M	D	M
Operate project				D
Maintain project		M	M	D

D – Decision making primary responsibility

M – Major involvements.

Prepare and validate architecture

This area involves preparation and validation of the following:-

i) Process and data entity

ii) Process /automated information system.

iii) The business strategy / process

iv) Business strategy /organization

v) Business strategy /data item.

Its importance to conduct the above so as;-

1. To understand how data is showed throughout the organization and between business processes.
2. To illustrate the process and information system interdependence.
3. To determine the relative important of data with respect to business strategy.
4. To identity organization responsibility and ensure optimum participation in the business process re-engineering projects.
5. Understanding the legacy and migration system impact in process re-engineering effort.

Prepare review and approve business systems plan

A good plan report should have the following setting;

1. Executive summary
2. Background section explaining objectives of studies and the methods used.
3. Studies perceptive highlighting the objective and expressed in strategic plans
4. Findings with respect to IS needs, requirements and opportunities.
5. Potential constraints based on the information system infrastructure that may hinder process re-engineering effort and suggested means of dealing with these constraints.
6. Information system strategy and recommendation based on implication of strategic plan.

7. Appendices of details architecture including application protocols and data structure.

The business system plan should be reviewed and approved by all functional managers in organization, once approved the plan is then passed into the next step that is process re-engineering.

CHAPTER 5
INFORMATION SYSTEM PROJECT MANAGEMENT

Meaning and importance of information system project management

Project Management is a set of principles, methods and techniques for effective planning of objective-oriented work, thereby establishing a sound basis for effective scheduling, controlling and re-planning in the management of programs and projects.
In other words, it provides an organization with powerful tools that improve the organization's ability to plan, organize, implement and control its activities and the ways it uses its people and resources.
A project is a non-repetitive one-of-a-kind activity normally with discrete time, financial and technical performance goals. Normally a complex effort, usually less than 3 years in duration and it is made up of interrelated tasks performed by various organizations.
The project management tools and principles provide the means for;

- project breakdown into tasks and sub-tasks
- finding interdependencies between the tasks
- allocating resources, human and material and smoothing resources
- estimation for total project duration and budget
- monitoring more efficiently project progress

Project management ideas are equally applicable to small as well as very large projects (with small and large number of tasks). However, the formal tools used are more appropriate for rather large projects.

Information system project management techniques

Project Management Tools

There are many tools available to assist with accomplishing the tasks and executing the responsibilities. Some require a computer with supporting software, while others can be used manually. Project managers should choose a project management tool that best suits their management style. No one tool addresses all project management needs. Program Evaluation Review Technique (PERT) and Gantt Charts are two of the most commonly used project management tools and are described below

PERT is a planning and control tool used for defining and controlling the tasks necessary to complete a project. PERT charts and Critical Path Method (CPM) charts are often used interchangeably; the only difference is how task times are computed. Both charts display the total project with all scheduled tasks shown in sequence. The displayed tasks show which ones are in parallel, those tasks that can be performed at the same time. A graphic representation called a "Project Network" or "CPM Diagram" is used to portray graphically the interrelationships of the elements of a project and to show the order in which the activities must be performed.

PERT planning involves the following steps.

1. *Identify the specific activities and milestones.* The activities are the tasks of the project. The milestones are the events that mark the beginning and the end of one or more activities.
2. *Determine the proper sequence of activities.* This step may be combined with #1 above since the activity sequence is evident for some tasks. Other tasks may require some analysis to determine the exact order in which they should be performed.
3. *Construct a network diagram.* Using the activity sequence information, a network diagram can be drawn showing the sequence of the successive and parallel activities. Arrowed lines represent the activities and circles or "bubbles" represent milestones.
4. *Estimate the time required for each activity.* Weeks are a commonly used unit of time for activity completion, but any consistent unit of time can be used. A distinguishing feature of PERT is it's ability to deal with uncertainty in activity completion times. For each activity, the model usually includes three time estimates:
    - Optimistic time - the shortest time in which the activity can be completed.
    - Most likely time - the completion time having the highest probability.
    - Pessimistic time - the longest time that an activity may take.

    From this, the expected time for each activity can be calculated using the following weighted average:

    Expected Time = (Optimistic + 4 x Most Likely + Pessimistic) / 6

    This helps to bias time estimates away from the unrealistically short timescales normally assumed.

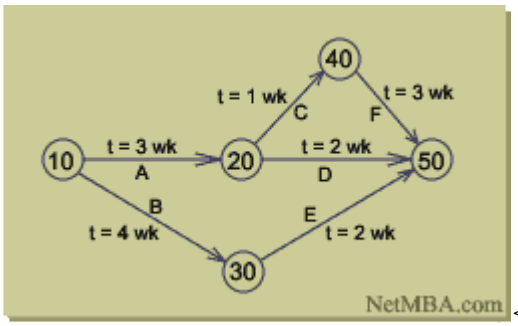
5. *Determine the critical path.* The critical path is determined by adding the times for the activities in each sequence and determining the longest path in the project. The critical path determines the total calendar time required for the project. The amount of time that a non-critical path activity can be delayed without delaying the project is referred to as slack time.

    If the critical path is not immediately obvious, it may be helpful to determine the following four times for each activity:

    - ES - Earliest Start time
    - EF - Earliest Finish time
    - LS - Latest Start time
    - LF - Latest Finish time

These times are calculated using the expected time for the relevant activities. The earliest start and finish times of each activity are determined by working forward through the network and determining the earliest time at which an activity can start and finish considering its predecessor activities. The latest start and finish times are the latest times that an activity can start and finish without delaying the project. LS and LF are found by working backward through the network. The difference in the latest and earliest finish of each activity is that activity's slack. The critical path then is the path through the network in which none of the activities have slack.

6. *Update the PERT chart as the project progresses.* As the project unfolds, the estimated times can be replaced with actual times. In cases where there are delays, additional resources may be needed to stay on schedule and the PERT chart may be modified to reflect the new situation. An example of a PERT chart is provided below:



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Benefits to using a PERT chart or the Critical Path Method include.

- Improved planning and scheduling of activities.
- Improved forecasting of resource requirements.
- Identification of repetitive planning patterns which can be followed in other projects, thus simplifying the planning process.
- Ability to see and thus reschedule activities to reflect inter-project dependencies and resource limitations following know priority rules.
- It also provides the following: expected project completion time, probability of completion before a specified date, the critical path activities that impact completion time, the activities that have slack time and that can lend resources to critical path activities, and activity start and end dates.

Gantt charts

Gantt charts are used to show calendar time task assignments in days, weeks or months. The tool uses graphic representations to show start, elapsed, and completion times of each task within a project. Gantt charts are ideal for tracking progress. The number of days actually required to complete a task that reaches a milestone can be compared with the planned or estimated number. The actual workdays, from actual start to actual finish, are plotted below the scheduled days. This information helps target potential timeline slippage or failure points. These charts serve as a valuable budgeting tool.

Sign of a failing information system project

- Lack of User Input
- Incomplete Requirements & Specifications
- Changing Requirements & Specifications
- Lack of Executive Support
- Technical Incompetence

Causes of information system project failure

• Lack of stakeholder/user input

• Incomplete and/or vaguely defined requirements or specifications

• Changing requirements or specifications

• Lack of executive support

• Insufficient planning

• Underestimated time and/or resources allocated for design, development, quality assurance, and/or quality control

• Technological incompetence

• Insufficient resources

• Unrealistic expectations

• Unclear objectives

• Unrealistic timeframes

• New or untested technology

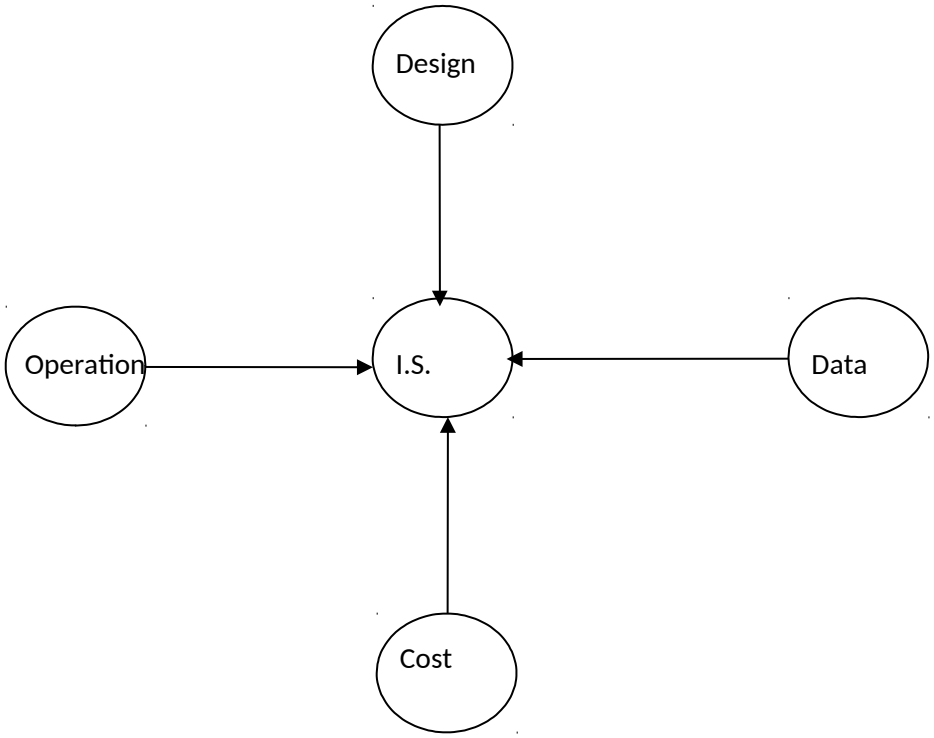
Explaining control measures and technique of a failing information system project

- Greater top management support
- More commitment from users
- More power and decisions making authority
- Greater financial control and flexibility
- Greater Control over staff resources

- Commitment to requirements and scope once specified
- More project management training
- Commitment to a stable project management method
- Alignment of IT project initiatives to business strategy
- Greater understanding of project management on the part of top management, project boards and clients
- Greater realism in setting targets. Several respondents railed against imposed rather than planned targets and deadlines
- Establishment of a supportive project/programme office.

Implementation failures and success

Many systems that are implemented normally fail. The problems causing implementation failure fall into multiple categories.



This could be due to technical and non-technical resources.

1. Design – The actual design of the system fails to capture essential business requirements or improve organizational performance. The system may be designed with a poor user interface.
2. Data – The data is the system may have a high level of inaccuracy or inconsistency. The information is certain fields may be erroneous or ambiguous.

3. Cost– Some systems operate quite smoothly, but their cost to implement and run on a production basis is way over the budget.
4. Operation – The system may not run well. The information isn't provided in a timely and efficient manner due to the result of breakdowns etc. The following factor provides a measure of a system that is successful.
   i. There is high level of system use
   ii. User satisfaction with the system – this might include users opinion or accuracy, timeliness and relevance of information and on the quality of service and schedule of operations.
   iii. Favorable attitude of users about I.S and the systems staffs.
   iv. Achieved objectives, the extent to which the system meets is specified goals, improved organizational performance and decision making resulting from the use of the system.
   v. Financial pay-offs of the organization i.e. by reducing cost or by increasing sales.

Causes of implementation success or failure

The outcomes of implementation can be determined by the following:-

1. The role of users is the implementation process.
2. The degree of management support for the implementation process.
3. The level of complexity and risks of the implementation progress.
4. The quality of management in the implementation process.

What can go wrong during implementation process?

a) Analysis:
   1. Time, money and resources haven't been allocated to researching the problem. The problem remains poorly defined.
   2. Little or no time is spent in preliminary planning.
   3. The project team isn't properly staffed.
   4. The information system promises results that are impossible to deliver.
   5. Requirements are delivered from inadequate documentation of existing systems or incomplete findings from systems study activities.
   6. Users refuse to spend any time helping the project team gather the required information.
   7. Project analyst cannot interview users properly.

b) Design
   1. Users have no responsibility towards the design of inputs, outputs and the processes. The design is reflecting the bias of the technical staff
   2. The system is designed only to serve current needs.

3. Drastic change is the clerical procedures or staffing with or without proper planning in the organization.
4. Financial specifications are inadequately documented.

c) Programming
1. Amount of time and money required for software development is underestimated.
2. Programmes supplied with incomplete specifications.
3. Not enough time is devoted to the development of the program logic.
4. Programs don't take full advantage of structured design (they do spaghetti programming).
5. Programs adequately documented.

d) Testing
1. Amount of time and money required for proper testing is underestimated.
2. The project team doesn't develop an organized test plan
3. Users aren't sufficiently involved in testing (no-user acceptance testing).
4. The implementation team doesn't develop appropriate acceptance tests for managerial review.

e) Conversion
1. Insufficient time and money are budgeted for conversion activity.
2. The system is made operated before its fully ready.
3. Not all stakeholders are involved .e. during training.
4. The system and users documentation is inadequate.
5. There is no performance evaluation and standards hence no framework for measurement.
6. Insufficient information systems personnel are trained to support the system and to make maintenance changes.

CHAPTER 6

INFORMATION SYSTEMS ACQUISITION

Evaluating MIS Applications

The I.T. investment management process begins with the project selection process. Projects being proposed for funding are put through a screening process to:-

1. Eliminate proposals that fail to pass minimal acceptance criteria.
2. Ensure that projects are being reviewed at the most appropriate organizational level. Proposals that pass this screening process have their cost, benefits and risks analyzed in-depth. Once this is accomplished, all fo the projects are compared against some common decision criteria and ranked based on their relative benefits, cost and risks. This process is appropriate in most projects and is the essence of I.T. portfolio analysis. The organization should have a process that outlines how to introduce projects for funding and how these projects would be severed for relevancy to the business sand its objective. Specify the organization should:-
    i. Identity initial requirements that projects must meet before funding can be released.
    ii. Explain how the screening would be conducted.
    iii. Establish roles and responsibilities for conducting the screening.

The screening criteria serves the following functions;-

1. Identity whether the project meets its initial acceptance requirements.
2. Ensure that the project is being reviewed at the most appropriate organizational level.
3. Identify what level of management scrutiny is appropriate given the projects type, size and risks.

On the basis of this screening process projects will either move or for more in-depth analysis or will be rejected.

Analyzing And Ranking MIS Applications; Based On The Benefits, Cost And Risks Criteria.

Each application should have a business case developed that provides the management justification for the system. The business case should identify the organizational needs that the application is meeting or proposes to meet, provide information on the benefits, costs, and risks of the application and establish proposed project development time frame and delivery schedule.

The organization should have an audit function that is responsible for verifying and validating the various analyses including cost/benefit analysis and risk assessment. This validation should include;-

1. Accessing all the alternatives that were analyzed and determining whether others should have been included.
2. Reviewing cost and benefit estimates to ensure that they are accurate and realistic.
3. Evaluating risks identified and determine whether others may be applicable.
4. Evaluating the sensitivity analysis that was conducted.

The organization should have the management information system that collects all the applications information. Their mechanism for collecting and maintaining applications will also be essential during the control and evaluation phase in order to:-

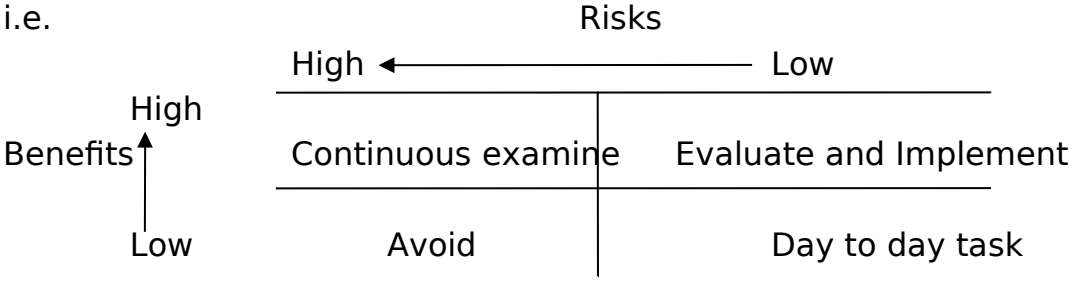
1. Help assess whether projects are still aligned with mission needs and organizational objectives.
2. Determine whether applications are meeting planned performance goals etc.

Decision should rarely be made based on only one factor such as the project cost. Using an assortment of decision criteria an organization can compare a number of factors.
The organization may assign weight for each category inorder to help prioritize a particular application.
An important point for an organization in developing such a scoring model or decision support tool is to define the scoring elements such as:-

1. Very poor
2. Poor
3. Average
4. Good
5. Excellent

The decision making process should help address difficulties associated with using different units of measure for analyzing different kinds of applications. No matter how vigorous or structured the organization's decision making process is, the decision to take the particular application lies with the management. If managers select applications that score low when compared to other projects e.g. high risk, high return profits, the justification for this should be documented and the applications progress constantly be monitored.

i.e.



Cultural dimension of IS development

When designing and understanding I.S the following check list should be considered:-

1. The environment in which the organization must function.
2. The structure of the organization, areas of specialization, standard operating procedures (SOPs), cultural and politics of the organization.
3. The type of organization type of ownership, nature and style of leadership.
4. The extent of support and understanding of the top management.
5. The level in the organization at which the system resides.
6. Principle interests groups affected by the system, decision and business processes that the information system is designed to assist.
7. Sentiments and altitudes towards workers in the organization who will be using the information system, history of the organization e.g. past investment in I.T., existing skills, important progress and human resource.

To design the above the developer must understand the hand and soft properties of the organization.

Hard Properties:

Characteristics

1. The problem can easily be defined.
2. The objective and data can be objectively addressed.
3. The problem is self-contained.
4. The information requirements are known.
5. The solution to a problem can be recognized.
6. Standard solution techniques are often available.

Soft Properties:

Characteristics

1. Often difficult to define the problem.
2. This involves taste, values, opinions and judgments.
3. The problem is fuzzy-edged (not clearly defined) i.e. we aren't so sure of what the solution will look like.
4. Its people oriented.
5. It requires soft system methodology approach (SSM).

Soft system methodology (SSM)

This is a user driver methodology developed by check-land. It's a way of analyzing unstructured and poorly defined problems in the real world. It recognizes that change is constant. It has the following assumptions:-

1. Its intended as an aid for managing complex organizational issues in a participative process. Its purpose is to enhance understanding of human situations that are perceived as problematic.
2. In organization there are many divergent perspectives on issues to be dealt with and each has to be considered.

SSM involves a process of enquiring which eventually leads to an action. It has seven steps.

1. The problem or situation must first be entered into.
2. The prevalent culture and power relations are used to express the problematic expression.
3. This findings are represented in a set of predefined solutions i.e. systems that are thought to be relevant to the particular problem.
4. Conceptual models are built where the verbal concepts previously defined are logically structured.
5. The model and redelity are compared.
6. Possible changes to the real world are considered. One of the framework that is used in SSM is the CATWOE definition which attempts to give root definitions of the problem.
7. It deals with who is doing what, for whom they are answerable, what assumptions are made and in what environment this is happening.

C – Customer – The who or people who benefit or suffer from the system.
A – Action – Who carries out the transformation process
T – Transformation – What is the conversion of input into output.
W – Welt a schaning – Assumption behind the root definition.
O – Owner – Who can stop the transformation.
E – Environment – What are to fixed elements outside the organization or system.

Methods for acquiring MIS applications

1. SDLC: This is a methodology for developing an information system that partitions the system development process into formal stages that must be completed sequentially with a very formal division of labor between the user and the specialists.
The characteristics of this method are;
   i. The development is in stage.
   ii. Its advantages for large organizational systems e.g. T.P.S.

iii. Supports project planning and control organization of team development effort and the production of a maintainable system.
iv. Relatively inflexible with respect to the user requirements that change during the development cycle.
v. There is vigorous documentation.
vi. It can be costly and time consuming.

2. Prototyping: This is the provision of a model that is given to the users for them to clarify their requirements and gain a measure of confidence in the general approach. In some cases the prototype is upgraded through several iterations, thoroughly undergoing testing and documentation. In some cases the prototype may be thrown away once the user requirements have been captured.

Characteristics

1. Development by gradually modifying an initial prototype based on feedback from the users.
2. It's a relatively fast development with early availability of the first model of the system (the first version).
3. Its advantageous when user requirements are uncertain.
4. It works well for project that are limited in size and for systems that are being computerized for the first time. Typical application of this is the development of DSS.
5. Unless precautions are taken it may evolve into a quick and dirty system hampering maintenance.

3. Internal development via end-user computing;-

This is the development of I.S by end-user with little or no formal assistance from technical personnel.

Characteristics

i. It leads to increased user satisfaction and involvement.
ii. It reduces applications back-log (this is the queue of systems awaiting implementation)
iii. It requires tools such as the fourth generation languages which are user friendly.
iv. It leads to improve requirements determination.
v. It requires the involvement of information centers /helpdesk /hotlines.

Information Centres /HELP DESK

This concept of an organization centre was developed in Canada in 1974 by IBM to support end-user. Its part and parcel of the corporate MIS function and its usually manned by technical people with extensive knowledge of the business. It has the following functions.

a) Assisting the end-users in evaluating, selecting, installing and maintaining hardware and software i.e. 'they help you choose the best'.
b) Provide assistance to end-users in accessing the data resource
c) It provides guidelines for system development and provides also modalities for preparing a prototype using a 4^{th} Generation language.
d) It supports all the installed software's within the organization.
e) Acts as a nit to provide standards of end-user systems.
f) It also provides a hotline or helpdesk in giving assistance to users. If thus help keeping track for the request and offer trouble shooting techniques.
g) Assist in setting standard and supports internal auditors in auditing the systems.
h) It trains end-users in operating systems that are to be introduced in the organization.

4. Off-the-shelf package

This is actually the purchase of a license to use the package. At times these packages may have to be tuned to fit the needs of the user company. When purchasing an off-the-shelf package, requests for proposals are sent to potential suppliers. This document outlines the requirements of the organization and asks questions as to how the vendor systems may satisfy them.

The selection is based on the characteristics of the software package and the requirements that the user organization wants.

Characteristics

i. They are more reliable and have better documentation than internally produced systems.
ii. They often need to adjust work within the organization to fit the needs of the package.
iii. It may cost the company to forego competitive advantages, if this was done internally.
iv. It satisfies most user requirements due to the fact that it has been developed by experts.
v. Due to its mass production its relatively cheaper to buyer and that the implementation is quick.

5. Outsourcing

This is the hiring of external firms known as the software houses or system integrators to develop and install systems that can easily be executed. They also perform other services i.e. developing strategic plans to carryout organizational functions. In the rather case we refer to this as facility management.

Outsourcing is necessary and appropriate in the following circumstances:-

1. When you want to reduce development cost.
2. Relief the firm from the burden of developing the system.
3. When the firms existing information systems capabilities are limited, ineffective or technical inferior.
4. When the company needs to off-load some of pending workloads from the I.S. department.

Problems of outsourcing

1. The firm may lose control over the I.S function i.e. No control over the type of software or hardware being used.
2. There is total vendor dependency i.e. the firm may have to pay whatever the vendor charges and accept whatever he does.
3. If the firm lacks expertise to negotiate a sound contractor, this dependency may eventually lead to loose of control over the technical direction.
4. Trade secrets may leak to outsiders and the company may lose competitive advantage.

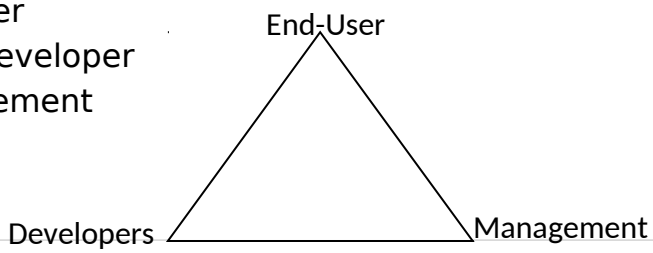
Solutions to outsourcing problems

1. Organizations should manage the outsources as they would manage this over information systems departments by setting priorities and targets to be met by the outsourced company.
2. Establishment of criteria to evaluate the outsourcing vendor.
3. Designing outsourcing contracts carefully so that outsourcing functions can be adjusted if the nature of the business changes.
4. A climate of trust should exist between both parties i.e. they should be in partnership.

Agents involved in MIS projects

Development of information systems will involve the following group:-

1. End-user
2. M.I.S Developer
3. Management



END-USERS:- It’s the function of the end-user to prepare their information requirement and to ascertain the working environment of the system developed by making sure that the system interfaces are proper.

M.I.S DEVELOPERS: - Their function is to implement system that satisfy user requirement as well as the objectives of the management by establishing that they have adequate resources, develop a quality system and meet the development constraints.

MANAGEMENT: - It’s the function of the management to control and allocate resources that go in the development of the system and to approve the various stages in the process.

(CHAPTER 7)
ROLE OF INFORMATION SYSTEMS (IS) IN ORGANIZATION

Information Systems and Business Strategy

Strategic information systems are computer systems at any level of the organization that change the goals, processes, services or environmental relationship to help the organization gain a competitive edge.

They are different from strategic level systems that focus on the long-term decision making. Strategic information systems reach all levels of the organization such that they take care of all the planning aspects of a given business firm.

Strategic Level and Information Technology

To key question at the business level of strategy is how can we compete effectively in this particular market? The most common strategies at these levels are:-

1. How to become the lowest cost producer.
2. How to differentiate your products or services form those of the competitors.
3. How to change the scope of the competition by either encouraging the markets to the global level or by narrowing such that the company focuses on a small niche not served by your competitors.
4. By establishing linkages with customers and suppliers.

No.	**Strategy level**	**Strategies**	**Models**	**IT techniques**
1.	Industry e.g. hotel services	Cooperation v/s competition, licensing and standard.	- Competitive forces model (5forces) or porter 5 forces model - Network economics	-Electronic transactions - Communication networks. -Inter organization system and information partnership.
2.	Firm e.g Unilever	- Synergy (cooperation of 2 companies - Core competences	Core competence	-Knowledge systems and -Organizational wide system
3.	Business	-Low cost producer -Product differentiation -Market differentiation - Locking customer /suppliers	- Value chain model (9 forces model)	-Efficient customer response -Data mining - Supply management -IT based products and services -Inter organization systems.

Application Of IS and Competitive Advantage in An Organization

The value chain model:

Support activities	Organization infrastructure Human Resource Management Technology Procurement				
Primary activities	Inbound logistics	Operations	Outbound logistics	Sales and marketing	Servicing

This model highlights the primary and support activities that add a margil of value to products or services where information systems can be best applied to achieve competitive advantage.
Primary activities would include:-

- Inbound logistics
- Operations
- Outbound logistics
- Sales and marketing
- Servicing

Support activities make to delivery of the primary activities of a firm possible e.g. the organization infrastructure, human resource management, technology and procurement.
Competitive advantages when a company provides more value to a customer or when they provide the same value at a lower cost. These can be achieved in the following way.

(i) A business can save money in the primary activities by having suppliers stick to fight delivery schedules.
(ii) A company can make use of technologies such as CAD/CAM thus reducing the cost of producing better goods in a manufacturing firm.
(iii) By having electronic scheduling and massaging systems or making use of office automation technology to improve the company image.
(iv) By making use of information system in sales and marketing a company can explore the capabilities existing on the internet.

Information System Product and Services

Firms can use 1.5 to differentiate their products and create brand loyalty by developing a new and unique product or service that isn't easily duplicated by the competitors. To following products and services were created or the basis of information system.

No.	**New product or service**	**Underlying technology**
1.	Online Banking	Private communication networks and internet
2.	Cash management systems	Enterprise wide customer accounting systems
3.	Global and national airline, hotel and reservation systems	Worldwide telecommunication based reservation systems.
4.	Fedex and other overnight package dealing systems	Delivery information acquisition device (DIAD). This is used for capturing information of customers and tracking connected to the headquarters.
5.	Voice mails systems	Company and network wide digital communication system.
6.	Automated teller machines (A.T.M)	Computerized accounting systems.

Market Focus /Niche

Companies create new market niches by identifying a specific target that they can serve in a superior manner. This is called focused market differentiation. This can be identified via data mining i.e. this is the analysis of large pools of existing data to find pattern and rules that can be sued to guide decision making and predict future behavior e.g. we can be able to extract information of people who buy a particular product such that we can be able to initiate a sales deal based on the information provided by the data mining tools e.g. a slow moving product that is normally bought by sugar manufacturing firms in the month of April.

Supply Chain Management and Efficient Customer Response Systems.

Firms are able to use I.T. to eliminate or greatly reduce inventory by "supply claim management". This is the integration of supplier distribution and customer logistics into one cohesive process e.g. Wall-Mart a leading supermarket in the USA has a continuous replenishment system which surds order for new goods directly to supplier as soon as customers pay up at the cash register.

Suppliers can also access Wall-Mart sales and inventory system using the web technology.

A supply chain is a collection of physical entries e.g. manufacturer, distribution centers, retail outlets, people and information which are linked together into a process that supplies good and services from the source by integrating demand planning, forecasting. Materials requisition, order processing and transport. Supply chain management not only lower inventory cost but can also deliver the product or service more rapidly to the customer.

It also creates customer respond system that responds to the customer demands more efficiently. The convenience and ease of using this rising the switching cost. These are the costs incurred in terms of lost time and finances when changing from one supplier system to a competition.

Firm Level Strategy and Information Technology

A business firm is typically a collection of businesses or of strategic units. Some of the questions to ask on strategy are:-

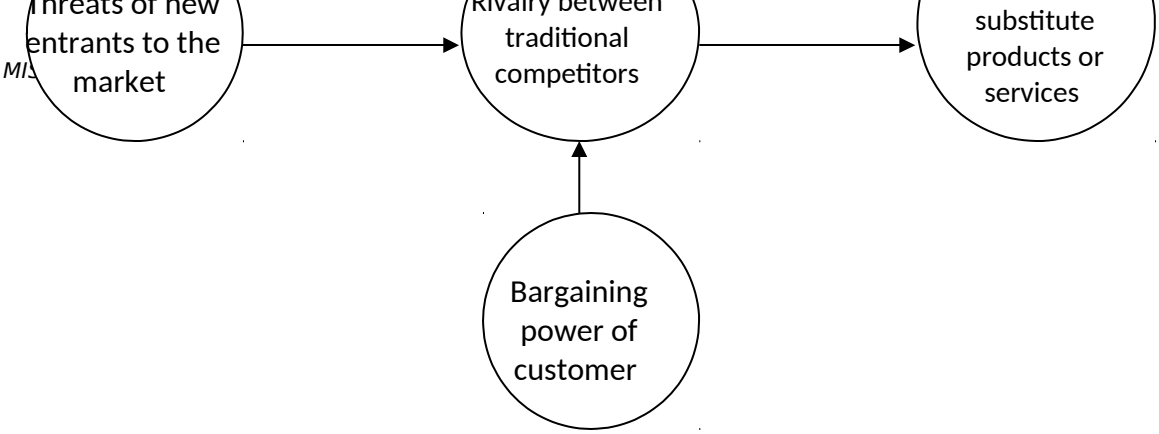
1. How can the overall performance of this business unit be achieved.
2. How can IT contribute?
   These can be answered in 2 ways i.e.
   i) Synergies – when output of some units can be used as inputs to the other or when two organizations pull markets together in order to lower cost and generate profits.
   ii) This is the time of two business entities so as to have a whole e.g. Kenya Airways and KLM, COOPERS and Waterhouse, B.P and Shell.

Industry Level Strategy and I.T

The key question is how and when should we compete as opposed to corroborating with others in the industry? This can be resolved via information partnerships which are a cooperating alliance between 2 firms for the purpose of sharing information to gain advantage.

i.e. two companies can join forces without actually weighting by sharing information e.g. Banks maintaining information for loans to share with other banks.

Five Forces Model: (Porters Model)



This is the model used to describe the interaction of the external influences, especially threat sand opportunities that affect an organization strategy and the ability to compete. Competitive advantage can be achieved by enhancing the firm's ability to deal with customers, supplier's e.t.c. By working with other firms the organization can use I.T. to develop and industry wide standard for exchanging information electronically which forces all market participants to similar standards.

Network Economics

This is a model based on the concept of a network where adding another participants entails a zero marginal cost but can create much longer marginal gain e.g. the larger the number of subscribes to the interest the greater the value. Internet sites can be sued by firms to build communities of users e.g. Microsoft Corporation uses I.T. to build a community of software developers e.g. MSDN (Microsoft Developers Network) who help in debugging, providing new application ideas and supplying customer with tips of the new application.

In summary there are four competitive strategies i.e.

i) **Market differentiation /Market focus**

This is when a company is able to identify the segment of a market (Niche) which it proceeds to serve in a supervisor version. The wide may be a customer segment, a narrowly defined product or a geographical region e.g. family T.V.

It relies on an extensive customer database and demographic data i.e. data related to population, as a potential tool in the niche (market identification).

ii) **Cost focus /Lowest cost producer.**

If a company serves a narrow market segment with a product or services which it offers at a significantly low cost than its competitors then this is the cost focus strategy.

Strategic information systems change the organization, its products, services and operating procedures.

iii) Product differentiation

When a company aims to distinguish its products or services from what offered by the competitors. The distinguishing features may be the superior attributes of the product itself e.g. Microsoft.

iv) Locking of customers /Suppliers

With strategy organization enhance or systems that make it difficult e.g. suppliers and customers to leave its supply chain e.g. mobile banking or banking direct where the Co-operative Bank and KCB ensure the continued loyalty of their services.

CHAPTER 8

INFORMATION SYSTEMS MAINTENANCE

Meaning and importance of information system maintenance

Systems maintenance involves cleaning, changing and enhancing the systems to make it more useful in achieving users and organizational goals.

Maintenance is the process of modifying an *information system* to continually satisfy organizational and user requirements. There is a vast difference between hardware and software *maintenance* in costs as well as in objectives. This means changing the application to adapt to a new hardware or software environment.

In some cases an organization will encounter major problems that will involve re-designing the entire system development process.

Importance of IS maintenance

1. Detect issues early, before they become problems

Whether the computer is new or old problems can pop up at any time. By using regular IT servicing one can get the jump on problems and make arrangements so that the business isn't impacted. Using regular IT servicing one can also help reduce IT support costs by fixing during scheduled maintenance windows where other work is scheduled.

2. Prevent against viruses and malware

Viruses and malware are a pain to any business, virus writers actively seek to disrupt the business and access files the network. When the computer is infected a number of symptoms may be felt, from annoying slowdowns to popup messages or contacts emails about strange email you apparently sent them. If your IT system is compromised the business could be used as a launching pad to infect other businesses, which can have consequences as companies start black listing your email address.

If antivirus software is kept up to date then it greatly reduces the chance of a virus infection as commonly known IT loopholes are closed to hackers and virus writers.

3. Speed up the Computer

Over time, files that are stored on the computer can become disorganized and fragmented, this results in slow loading times and delayed access to programs and files. By regularly running speed checks and smart optimization, we can speed up the computers loading times and take care of those annoying pauses when one is busy and need quick and efficient access to the files and software.

4. Keep Antivirus Software Up-to-date

Antivirus software is vital and every PC should be protected but having antivirus software installed isn't the end of your IT security – it needs to be up-to-date and working as intended .

5. Maximize Software Efficiency

Computers age and over time they start to slow down – software packages that performed quickly and efficiently to begin with, can become sluggish and have a negative impact on productivity. Because this slowdown has occurred over many years, the computer user may have grown used to the issue and may think that it is normal. It's not normal. Regular checks should be done to ensure that the software is running to its maximum efficiency – often the answer is just a slight hardware modification or a quick clean out of programs that are no longer needed.

Reasons for maintenance

Once a program is written its likely to require ongoing maintenance. To some extent it may require tune-ups and repairs. Some of the major reasons for program maintenance are:-

i) Changes in business processes.
ii) New requests from stakeholders, users and managers.
iii) Bugs or errors in the program.
iv) Technical and software problems.
v) Corporate mergers and acquisitions e.g. Glaxo Smithkline, HP-Compaq.
vi) Government regulations
vii) Changes in the operating or hardware on which the applications runs.

When it comes to making necessary changes, most companies modify their existing programs instead of developing new ones. i.e. if new system needs are identified, then the old programs are repeatedly modified to meet the even changing needs.
Over a period of time these modifications tend to interfere with the system overall structure, reducing its efficiency and making it more difficult to modify future cases.

Types of maintenance

a) **Adaptive maintenance** refers to the changes made to a system to evolve its functionality to changing business needs or technologies.
b) **Corrective maintenance** refers to changes made to a system to repair flaws in its design, coding, or implementation.
c) **Perfective maintenance** refers to changes made to a system to add new features or to improve performance.
d) **Preventive maintenance** refers to changes made to a system to avoid possible future problems.
e) **Predictive Maintenance**: It pursues constantly know and report the status and operational capacity of the installations by knowing the values of certain variables, which represent such state and operational ability. To apply this maintenance, it is necessary to identify physical variables (temperature, vibration, power consumption, etc.). Which variation is indicative of problems that may be appearing on the equipment. This maintenance it is the most technical, since it requires advanced technical resources, and at times of strong mathematical, physical and / or technical knowledge.

f) **Zero Hours Maintenance (Overhaul):** The set of tasks whose goal is to review the equipment at scheduled intervals before appearing any failure, either when the reliability of the equipment has decreased considerably so it is risky to make forecasts of production capacity . This review is based on leaving the equipment to zero hours of operation, that is, as if the equipment were new. These reviews will replace or repair all items subject to wear. The aim is to ensure, with high probability, a good working time fixed in advance.

g) **Periodic maintenance (Time Based Maintenance TBM):** the basic maintenance of equipment made by the users of it. It consists of a series of elementary tasks (data collections, visual inspections, cleaning, lubrication, retightening screws,…) for which no extensive training is necessary, but perhaps only a brief training. This type of maintenance is the based on TPM (Total Productive Maintenance).

Systems Maintenance Techniques

*1. Emergency Maintenance**:***

This is due to the malfunction or **"bug"** in the system where maintenance is urgent and usually calls for immediate attention.

The malfunction is because it has not been tested completely, even though the system must have run perfectly for months or even years. The information system user usually identifies the malfunction. Then a team of analysts and programmers should rectify it if the malfunction is in computer program and caused by a system input.

2. Routine Maintenance:

Routine Maintenance is required to keep systems performance in order as it reflects the organization environment. The activities may be rewriting manual procedures, conducting training sessions, altering report formats and contents and forming new processing logic for computer programs.

3. Special Reporting Requests:

These are periodic requests for tactical and strategic management information, which does not come under routine production. These special requests can be satisfied directly by a user with a database management system and the analyst assists in preparing the necessary procedures for the request, e.g. A special report on selected products during a sales promotion or a special analysis of a particular vendor's delivery performance.

Problems of Systems Maintenance:

The system always undergoes **continued modification** due to various reasons. The application systems need changes and sometimes it takes away half or more of an organization's allocated resources and time. Thus, many organizations have adopted the principle of setting a budget for maintenance and perform only the highest priority maintenance work.

The personnel working in the information system do not wish to spend most of their time maintaining or trying **to patch up** systems designed and implemented years ago. In some organizations, the programmers are rotated once in a year.

By this the programmers will have new assignments, the experience base of the personnel is broadened, better ideas are being proposed and evaluation of the personnel and the performance of two or more persons and the several project leaders can be compared.

Maintenance programming **causes more failure than the developing programming**. If the maintenance programmer is not familiar with the program, the management should assign complex maintenance problems to the most knowledgeable people to avoid failure.

If the **documentation** is poor and changes will result in serious failure and to overcome this, the management is responsible to ensure that all programs are properly documented.

Extra training cost will go up maintaining for older applications that use outdated programming languages that run under primitive operating systems. The situations like facing inadequate documentation, a variety of incompatible hardware/software configurations, outdated equipment and procedures will give rise to manageable conditions with severe problems of maintenance that continue indefinitely.

Maintenance Costs

Several factors influence maintenance costs. Three of these are very important:

- defects,
- customers, and
- Documentation quality.

The number of latent defects refers to the number of unknown errors existing in the system after it is installed. Because corrective maintenance accounts for most maintenance activity, the number of latent defects in a system influences most of the costs associated with maintaining a system. If there are no errors in the system after it is installed, then maintenance costs will be relatively low. If there are a large number of defects in the system when it is installed, maintenance costs will likely be high.

A second factor influencing maintenance costs is the number of customers for a given system. In general, the greater the number of customers, the greater the maintenance costs.

A third major contributing factor to maintenance costs is the quality of system documentation. Without quality documentation, maintenance efforts can increase exponentially.

Techniques of maintaining an information system

Software companies and many other organizations use the following 4 categories to signify the amount of change. These would include;-

1. Slip steam maintenance
2. Patch
3. New release
4. A version

A Slip Stream
This is a minor upgrade – Typically a code adjustment or a minor bug fix, not worthy announcement. It usually requires recompiling of the code and in so doing it may create entire new bugs. These practice accounts for the various variations that we notice on a software that is running or similar machine.

A Patch
This is a minor change to correct a problem. It's usually an addition to an existing program i.e. the programming code representing the system enhancement fix is usually patched into or added to the existing system code e.g. Microsoft releases patches which they call service packs to correct the bugs that were in the internet explorer and Windows 95.
In correcting the problem this opened a way for hackers and unscrupulous website operators to read the contents of the files of the users.

A New Release
Is a significant program change that often requires changes in the documentation of the software?

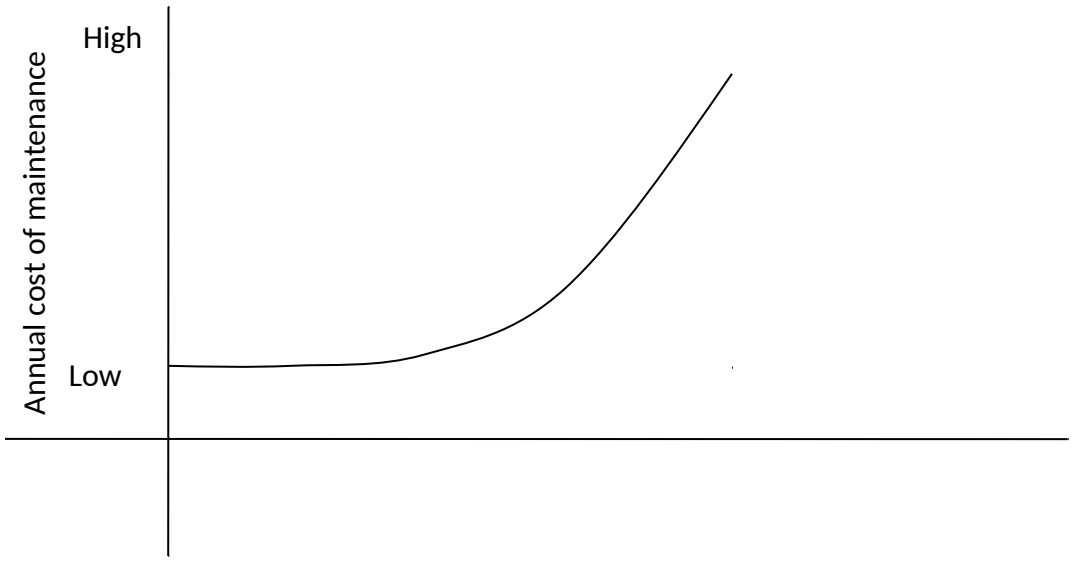
A new version
Is a major program change that brings many new features?

THE REQUEST FOR MAINTENANCE FORM
Due to the amount of effort that can be spent for maintenance, many organizations require a request for maintenance through a form so that modifications can be authorized to the programs. The form is usually signed by a business manager who documents the business scales for the need for change and identifies the priority of these changes relative to the other work that has been requested.
The information system department that reviews the form and identifies the programs to be changed determines the programs assigned to project or systems, estimates the expected completion dates and develops a testing procedure. A cost benefit analysis may be required if the change requires substantial resources.

Depending on the organization policies, the people who perform system maintenance vary. In some cases the team that designs and builds the system also performs maintenance. This gives the designers and programmers incentives to build systems right from the onset. If there are problems, the designer and programmer will have to fix them. In other cases organizations have a spate maintenance team.
The team is responsible for modifying, fixing and updating existing hardware.

Financial implication of maintenance

For older programs the total cost of maintenance can be up to 5 times greater than the cost of development. The average programmer can spend over 50% of the time a maintaining existing programs instead of developing new ones. Furthermore as programs get older the total maintenance expenditures in time and money increases.



The financial implication of maintenance makes it importance to keep track of why systems are maintenance instead of simply keeping cost figure.

There is good reason why documentation is important. A determining factor in the decision to replace a system is the paint at which its costing more to fix it than to replace it.

Relationship between maintenance and design

Programs are expensive to develop but they are every more expensive to maintain. Programs that are well designed and documented would be efficient, structured and flexible and are less expensive to maintain. There is a direct relationship between design and maintenance. More time spend in design upfront can mean less time spent on maintenance later.

In most cases, the worth the extra time and expense to design a good system. The need for a good design goes beyond the cost. There is a real risk in ignoring small system problems when they arise as these small problems become large in future.

Hardware maintenance

This is relatively straight forward and may include;

a) Formulating a service contract with the vendor.
b) Insisting on warranty during the procurement of equipment's and enforcing the warranty if the equipment fails.
c) Creating a technical section within the I.T. department with the responsibility of maintaining all the equipment. This would depend on factors such as availability of staff, convenience, cost and complexity of the system e.t.c.

Database maintenance

It's carried out by a database administrator whose functions generally include;-

1. Participating in the physical database design.
2. The operation and maintenance of the DBMS.
3. Monitoring the performance of DBMS
4. Monitoring the security aspect of the database.
5. Liaising with the users and development team.
6. Providing assistance to users in utilizing effectively the database potential.
7. Acting as the custodian of the data dictionary.

CHAPTER 9
ROLE OF ICT IN ORGANIZATIONAL CHANGE

Organization Change

Organizations in both the public and private sectors are faced with an apparently ever-increasing rate of change and must learn to cope with this problem. Change occurs in many ways: competitive pressures (e.g. a competitor introduces a new model or reduces prices), legislative changes (e.g. the introduction of the National Curriculum in UK schools), the operating environment (e.g. the challenge of online share dealing to traditional stock brokers), changing client/consumer preferences (e.g. the desire for more leisure or more environmentally friendly products), the introduction of new technology (e.g. computer networks, third generation telephones) and many more. In addition to dealing with the change itself, management must cope with the resistance to change often encountered from staff, clients, customers or trade unions.

Not all pressures for change come from outside the organization. Successful managers seek to anticipate market or environmental movements by initiating change within the organization and thus adopt a pro-active rather than a reactive approach. One means of making radical changes in organizations is by adopting what is called Business Process Re-engineering (BPR). BPR moves away from the conventional emphasis on tasks and structures in order to focus on business processes. In effect, BPR is a systematic method of lateral thinking which forces people to think beyond normal boundaries and structures. BPR is dealt with in detail in the next chapter.

Organizations do not automatically adjust to change. Adaptation only occurs as a result of management actions. These may cause changes in the way the organization takes decisions, in the processes used, in the services or products, or in the structure of the organization itself. Only one thing is certain: the organization that clings to rigid, traditional methods in the midst of rapid change will be an unsuccessful organization.

Ways to manage change

Many valuable pointers to the way more successful organizations manage change and innovation have come from studies by Moss Kanter, Peters and Waterman, and others. Moss Kanter found that organizations that adopt an integrated approach to innovation did it more successfully than those that adopted a more piecemeal approach, which she termed 'segmentalist'. To overcome resistance to change and inertia she suggested the following actions:

- Top management must support innovation in a personal way and must think interactively.
- The organization must be made 'flatter', i.e. unnecessary layers of hierarchy should be removed and staff 'empowered' by authority being pushed downwards.
- Communication should be improved, especially across the organization, and staff mobility encouraged.
- Achievements should be highlighted and a culture of pride cultivated.
- Company plans should be made known earlier and more widely to enable staff to make suggestions and contribute before decisions are made.
- An alternative way of considering the problem of resistance to change is the force field framework first suggested by Lewin and developed by other workers such as laslen and Platts.
- Lewin suggested that change, or the lack of it, is caused by the interaction of two sets of opposing forces. One set is termed the driving forces i.e. the forces attempting to bring about change, the other set being termed restraining forces which act in the opposite direction and seek to maintain the status quo.

According to this framework, any attempt to bring about change requires conscious attempts to overcome resistance to change otherwise change will not occur because the forces resisting it will be too strong.

Impact of IS as an agent of organizational change

(a) Rationalization

(b) Business Process Re-Engineering (BPR)

BPR is claimed to be a radical approach to the way organizations view work to be done. BPR was initiated by Hammer and Champy and defined by them thus: Re-engineering... is the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical contemporary measures of performance, such as cost, quality, service and speed'.

BPR is a systems-oriented approach to organizing work and concentrates on Business processes not on traditional tasks and structures.

Hammer and Champy describe processes as: 'A collection of activities that takes one or more kinds of input and creates an output, that is of value to the customer/ typical processes include manufacturing, ordering, delivery and invoicing. It will be seen that this way of looking at work is directly comparable to the systems approach.

Processes have 2 important characteristics i.e.

1. They have customer (internal or external)

2. They cross organizational boundaries i.e. they occur across or between organizational sub-units.

One technique for identifying business processes is an organization is the value chain proposed by porter. Processes are generally identified in terms of the beginning and end points, interfaces and organizational units involved. Examples of process include developing a new product, ordering goods form a supplier, creating a market plan and processing and paying an insurance claim etc.

BPR has been, and is being, used by a number of organizations, e.g. the UK Treasury, Lloyds Bank, Ford Motor Company and the New York Police Department, and many successes have been claimed for the approach. For example, the New York Police Department claims that the substantial drop in crime in the 1990s was partly due to the streamlining of the organization and the different approach to work which resulted from the use of BPR.

BPR seeks to rethink the process from scratch without regard to existing methods, structures and departments. It is claimed that the re-engineering approach leads to numerous changes in the way work is done, how employees behave and in the structures of the organization itself. Typical of these changes are:

- Individual jobs and tasks get combined with related jobs and tasks
- Jobs tend to become more multidimensional and comprise a range of tasks
- There is more emphasis on process teams rather than traditional functional departments.
- Empowerment of workers increases. More decisions are made by process teams, there is more flexibility and less reliance on formal rules, there are fewer checks and controls.
- Work is performed where it is most sensible and efficient, i.e. normal boundaries and demarcations do not apply.
- There needs to be more emphasis on education and understanding why the job is done rather than merely basic training which concentrates mainly on how the job is done
- Organizational structures become flatter and less hierarchical.
- There are likely to be major differences in culture and attitudes, e.g. customers become much more important, advancement will be based on ability, the focus for payment and performance will be based on results measured in terms of value to the customer.
- Challenging traditional methods, structures, and ideas becomes a normal part of work.

Naturally enough, some of the more extravagant claims made for BPR have been challenged by other writers. Coulson-Thomas, for example, thinks that much of what is termed BPR is only process simplification within existing frameworks and is a cover for cost reduction and downsizing (i.e. reduction in staffing levels).

The staffs that remain after BPR are pressurized and have to work much harder, other writers, such as Talwar, think that much of BPR goes beyond the scope of work design and is more applicable to strategic management and organizational change.

How Does BPR differ from TQM

Tengetal in 1994 stated that in the recent years increased attention to business processes is largely due to the Total Quality Management.

Davenport observed that quality, specializes tend to focus on incremental change and gradual improvement of processes, while proponent of re-engineering often seek radical redesign and drastic improvement of processes.

TQM is a continuous process that refers to programs and initiatives that emphasis the incremental improvement in work processes and outputs over an open ended period of time. In contrast, re-engineering also known as business process re-design on process innovation refers to the discrete initiatives that one intended to achieve radically redesigned and improved work processes in a bounded time frame.

In 1993 Daveport contrasted the two i.e. TQM and BPK.

	SUBJECT	**TQM improvement**	**BPR Innovation**
2.	Level of change	• Incremental	• Radical
3.	Starting point	• An existing process	• Clean slate (New process)
4.	Frequency of change	• One time or continuous	• One time
5.	Time required	• Short	• Long
6.	Participation	• Bottom-up	• Top-Dower
7.	Typical scope	• Narrow and within the functions	• Broad and cross function
8.	Risk	• Moderate	• High
9.	Primary enabler	• Statistical control	• Information Technology
10.	Type of change	• Cultural	• Cultural and structure

What Is The Relationship Between BPR And I.T?

I.T is a key enabler of BPR which can bring a radical change. Hammer in 1990 prescribes the use of I.T to challenge the assumptions inherent in the work processes that have existed long before the advent of modern computer and communications technology. He

argues that at the heart of re-engineering is the nation of discontinuous thinking or recognizing and breaking away from outdated rules and fundamental assumption underlying operations. These rules of work design are based on assumptions about technology, people and organizational goals that no longer holds.

He suggests the following principles of re-engineering.

1. Organize a round outcome and not task.
2. Have those who use the output of the process perform the process.
3. Identify the information processing work into real work that produces information.
4. Treat geographically dispenses resources as though they were centralized.
5. Link parallel activities instead of interacting their results.
6. Put the decision point where the work is performed and build control into the process.
7. Capture information once and at the source.

Daverport and Short (1990) argues that BPR requires taking a broader of view of both I.T and business activities and of the relationship between them.

I.T should be viewed as more than an automating or mechanizing force to fundamentally reshape the way business is done. I.T capabilities should therefore support business processes and the business processes should be in terms of the capabilities I.T can provide. It's this that is referred to as the Broader, responsive view of I.T and BPR as the new industrial reengineering.

	CAPABILITY	**IMPACT /BENEFIT**
1.	Transactional capability	I.T can transform unstructured processes into structured ones.
2.	Geographical capability	I.T can transfer information rapidly and easily across large distances making processes independent of the geography (Global networks).
3.	Automation capability	I.T can replace or reduce human labor in a process.
4.	Informational	I.T can bring vast amount of information into a process.
5.	Sequential	I.T can enable changes in the sequence of tasks in a process often allowing multiple tasks to be worked on simultaneously.
6.	Knowledge and management	I.T allows capture and dissemination of knowledge and expertise to improve processes.

7.	Tracking capability	I.T allows detailed tracking of status, inputs, outputs in processing e.g. in panel delivery companies e.g. DHL, UPS, Fedex etc.

Business process reengineering can be divided into two i.e.

1. Operational processes which relate to the customer or produce e.g. product development, customer acquisition and manufacturing.
2. Management – This deal with obtaining and coordinating resources e.g. performance, monitoring, assets, information and human resource management.

BPR Methodology:
The following is a five step approach to BPR:

1. Develop the business vision and process objectives.
2. Identify the processes to be re-designed.
3. Understand and measure the existing processes.
4. Identify the I.T. enabler.
5. Design and build a prototype of the new process.

(c) AUTOMATION

The role of internet, intranet and extranet to an organization
The internet is an international network of computers numbering 100s' of 000's of private and public networks. The following functions are available on the internet.

	FUNCTION	**DESCRIPTION**
1.	To communicate and collaborate	This involves sending of E-mails messages, transmission of documents and the participation of electronic conferences.
2.	Access information	The searching for documents and databases and the reaching of electronic brochures, manuals, book and adverts and the access of library catalogues
3.	Participate in discussions	One can joint interactive discussion groups and transmits voices electronically.
4.	Supply information	This involves the transfer of computer files, computer program, graphics,

		animations and video games.
5.	Find entertainment	Plant interactive video games and watch movies
6.	Exchange business transactions	A company can advertise, sell and purchase goods and services.

An intranet is an internal network based on the internet W.W.W standards. The principle difference between the web and the intranet is that whereas the web is open to everyone, the intranet is private and protected from the public using firewalls.
An extranet is a private intranet that is accessible to selected outsiders. Its used to link organizations with customers, business partners and providers information or product availability, pricing, shipment data and E.D.I ad E.F.T.

Benefits of internet to organization

1. **Connectivity and Global Reach**
   The value of the internet lies on the ability to easily and inexpressively connect so many people from so many places over the globe. This coupled with the ease of use, help customers to link directly to suppliers and business partners etc. They can also trader and advertise across the bounder.

2. **Reduced communication cost:-**
   Organizations are able to reduce on their mailing, telephone and faxing charges by half.

3. **Low transaction cost**
   Electronic transactions are much cheaper than paper based ones.

4. **Reduced Agency cost**
   Producers can coordinate directly with the consumer have reducing the cost for agencies or the so called middlemen.

5. **Interactivity, flexibility and customization**
   Internet tools can be used to create interactive applications e.g. the use of E-mails and electronic discussion groups to create on going dialogues with the customers.

6. **Accelerated distribution of knowledge**
   Web browser software provides a universal interact of accessing information resources. It also helps in interactive marketing which uses the web to hold the customer attention or to capture information about their tastes and interest e.g.

Reebok International Customer services and support can be done online e.g. The Del Computers use a Del newsgroup on the net to handle customers complains.

CASE STUDY:

- The internet has transformed the way many organizations work. This is particular so with regard to business. The internet has been able to save businesses money and also non-profit making bodies like charities.
- For large corporations the internet offers the chance to cut overheads by moving various co-functions online such as recruitment, press relations, share-holders information, educational resources and technical support online. At the other end of the scale virtual organization can eliminate the used for expensive office space and reduce the reliance on paper work.
- Service companies such as accountants and legal firms are creating virtual offices with customers and staffs linked by the internet. For all organization online procurement is possibly a way to save all large amount of money.
- Microsoft says its internet based procurement system saver its almost $3,000,000 a year handling over 250,000 transactions. It uses this online volume to negotiate favorable process with suppliers of office equipment, books, computer and catering services.
- The online system cuts administrative costs from $60 to $5 an order.
- Another US company Chryster i.e. a car maker and says that it saver 1.3M dollars a year by not having to key in invoices previously send in by suppliers not using the EDI but who now use the internet. The company is also getting components from supplier’s up to 11 days faster than before. The reduction is cycle time reduces the cost per transaction from 28 dollars to 7 dollars.
- One form of extranet is the courier tracking system operated by the federal express (Fedex). Supermarket claim call Sainsbury is creating an extranet so flat supplier can contact key personnel online, access information about stock, price changes and sales forecast. And also find out how their products are selling.
- Many manufacturers like Xerox and BMW provide extensive produce details that generate sales leads and offline sales via distributors. The internet is now the main head generator for Toyota. Its website has overtaken Toyota’s 800 toll free numbers in the U.S as its best source of lead.

Challenges to the management (ORGANIZATION)

1. Security and privacy of the company and the individual.
2. Legal issues of the role of electronic signatures and the application of copyright laws to electronically copied documents.
3. Technology handles e.g. Bandwidth where on ISP has been unable to keep on with the demand.

4. Internet based transactions aren’t recognized by law i.e. There is no legal backing.

MANAGEMENT, CONCEPTS (Theory)

Management is the process of providing an organizational environment in which individuals work to contribute to the overall goals of the organization.

The main objective of management is the effective and efficiencies transformation of resources such as capital, labour, raw materials and information into profitable and marketable products.

The way organizations work today is attributed by the contributions made by management theorists or thinkers in what is referred to as the school of thoughts.

	School of thought	**Names of contributors and principle dates**	**Contribution for management theory**
1.	Scientific management	Frederick Taylor (1911) Hendry Gantt Trank & Lillian Gibreth	How to maximize productivity through efficient workflows by letting and controlling measurable performance standards.
2.	Administrative management	Henry Fayol (1916)	Recognition of management as a scientific discipline whereby the introduction of divisions of work according to specialization with direct relationship of responsibility to authority, degree of centralization and authority based on organization contingency plans and the claim of authority within the organization.
3.	Behavioral and social approach	Hugo Miinsterberg (1913) Ecton Mayo (1933)	The recognition of social groups in people and psychological satisfaction of needs. Management via interaction of motives, ideas and action of individuals.
4.	Decision making approach	Herbert Simon (1960)	Decision making as a fundamental managerial authority. The use of quantitative models to support decision making. Recognition that people have limited national capabilities thus system must be structured to support decision making.

Henry Fayol and other writers classified the functions of a manager as follows:-

2. Planning
3. Organizing
4. Co-coordinating

5. Decision making
6. Controlling
7. Leading
8. Communicating
9. Motivating
10. Staffing

1. Planning
   This is a future based activity. It involves making decisions about organizational aims or objectives. How the plan is to be carried out, with what kind of resources, what policies are to be used and finally the methods of measuring the results.
   It must be carried out against a background of external environment and the organizational resources. I may be termed as a long, medium or short term.

2. Controlling
   A method of measuring the systems progress against a previously set standard and correcting any deviations that occur during the time span of the system. It requires that a measurable standard is set at the stat of system and a means of measuring progress against the standard is set up that would be operating during the time span of the system.
   It's also a means whereby corrective action can be taken as appropriate.

3. Organizing
   This may involve structuring an organization into sections, departments and divisions and allocating tasks to each of them and delegating authority and responsibility. It's the coordination of human and material resources to carry out the work.
   Organizing requires appropriate communicating channels to be set up.

4. Leading
   This is the ability of a manager to influence human resources to follow instruction or to do a job. A manager must understand the task, the term and the individual to be an effective leader. The tasks and functions include; the planning of the tasks, allocation of responsibility and setting standards of performance.
   Team functions are directed, towards team building, motivation of the team members, communication and discipline.
   Individual maintenance functions are directed towards training, counseling, motivation and development.

5. Communication

This is the comprehensive transmission of managers from a source to a destination with a view of causing some reaction or sharing the meaning. The manager is usually the intermediary between chief executive and rest of the staff.

6. Motivation
   Influence on the human resource to strive willingness inorder to achieve the organization's objectives. Motivation can be materials wise or via intangible elements such as recognition or a flexible working environment.

7. Staffing
   This is the selection, training and appraisal of the human resources to work for an organization. The management must know how to develop the staff.

8. Decision Making
   This is selection of the best course of action among the several alternatives available.

Managerial Roles

These are the expectations of the activities that managers should perform in an organization. They can be classified as follows:-

1. **Interpersonal roles**
   Managers acts as figure heads for the organization when they represent their company to the outside world and perform symbolic duties such as giving out employees awards. They also act as leaders attempting to motivate or to council and support subordinate.
   The manager also acts as liaison between various levels of the organization

2. **Information roles**
   Managers acts as the nerve centers of the organization receiving the most concrete and up-to-date information and distributing it. As dissemination and spokesman of the organization they are supposed by management information systems, mail and office system.

3. **Decisional roles**
   Managers acts as the entrepreneurs by initiating view activities. They handle disturbances in the organization. They allocate resources and negotiate conflicts and mediate between conflicting groups in the organization. There is no single theory of management that is anniversary accepted, common theories include:-
   i) The universal approach

It states that the administration of all the organization require the same rational approach. It assumes there is a core management process that remains the same across the organization.
It emphasis on the division of labor, chain of command and authority.

ii) Operational approach

This is a scientific approach which conducts a business by establishing standards gained through systematic observation, experiment or reason. It centers on the standardization of work, time and task study, systematic selection and training of workers.

iii) Behavioral approach

It advocates that successful management depends largely on one's ability to understand and work with people who have a variety of backgrounds, needs perceptions and aspirations.
It emphasis that people are key to productivity and that technology, work rules and standards don't guarantee good job performance.

iv) Systems approach

This assumes that the whole is greater than the sums of the individual tasks (synergy). The manager must not become pre-occupied with one aspect of the organizational management while ignoring other internal and external realities.

v) Contingency Approach

Emphasis or the choice of an alternative cause of action depending on the situation at hand. Management should be flexible and streamlined to adopt quickly to the change.
NB: A manager can use any of the above approaches.

CHAPTER 10

INFORMATION SYSTEM ETHICS

Ethics refers to the principles of rights and wrong that can be used by individuals acting as free moral agents to make choices to guide their behavior. Information systems raise new ethical questions for both individuals and society because they create opportunities for intense social change and they threaten existing distribution of power, money, rights and obligations. These issues have 5 dimensions.

1. Information rights and obligations – what rights do individuals and organization posses with respect to information about themselves?
   What can they protect?
   What obligation do individuals and organization have a conceiving this information?
2. Property rights – How will traditional property rights be protected in a digital society in which trading and accounting for ownership is difficult and ignoring such property rights is it so easy.
3. Accountability and control – who will be held responsible, accountable and reliable for the harm done to individuals and their property rights.
4. System quality – what standards of data and system quality should we demand to protect the individual rights and the safety of the society.
5. Quality of life – what values should be preserved in information and knowledge based society?
   What institution should we protect from violation?
   What actual values and practices are supported by the new technology?

Key technology trends that raise ethical issues

1. The doubling of computer power every 18 months has made it possible for most organizations to utilize information systems for the core production processes. Leading to an increase in dependency on systems, vulnerability to system errors and poor data quality.
   There are no social rules and laws adjusted to this dependency and standards for ensuring the accuracy and reliability of information systems.
2. Advance in data storage techniques and rapidly declining storage costs has been responsible for the multiplication of databases e.g. employees, customer and potential customer maintained by private and public organization.
   These advances make routine violation of individual's privacy both cheap and effective.
3. Advances in determining techniques for large databases, organization collect and combine information about a customer from credit card purchase, telephone calls,

banking records and police records. If properly mine this can reveal credit information, living habits, tastes, association and political interests.

4. Advances in networking – this greatly reduces the cost of moving and accessing large quantities of data and open the possibility of mining large pools of data remotely using small desktop machines permitting and invasion of privacy.

   The global digital superhighway communication network posse's social and ethical concerns such as:-

   i) Who will account for the flow of information over the networks?
   ii) Will you be able to trace information collected about you?
   iii) What will these networks do to the traditional relationships, families, work and leisure?

Ethical Principles:-

1) The golden rule – do unto other as you would have them do unto you.
2) Kant's categorical imperative – if an action is not right for everyone to take then it's not right for anyone to take.
3) Descarte's rule of change – if an action can't be taken repeatedly, then it's not right to be taken at any time.
4) Utilization principle – take the action that achieves the higher or greater value.
5) Risks aversion principle – take the action that products the lease lewd on the least potential cost.
6) No free lunch – virtually all tangible and intangible objects are owned by someone unless there is a specific declaration otherwise.

Professional Codes of Ethics (CONDUCT)

These are special rights and obligations take on by professional due to their special claims of knowledge and wisdom. It also entails respect e.g. institute for the management of information system (IMIS), Association of Business Executive (ABE), ICPAK, Law Society of Kenya (LSK) and Association of Computer Machinery Codes (ACMC).

These promise the professionals to regulate themselves in the general interest of the society e.g. avoiding harm to other, honoring property rights including intellectual property and respecting privacy.

They also determine entrance qualifications and competence consider an e.g. British Computer Society (BSC) which was formed in 1957 and become a full member of England Engineering council in 1990. It's a professional body of computer practitioners in the United Kingdom and has more than 34 members.

The society is concerned with development of computing and its effective applications.

It has assumed responsibilities for education and training for public awareness and for standards of quality and professionalism.
Its role is to set the professional standards of competence conduct and ethical practice in the U.K. It's an authoritative voice to the society government and industry or all aspects of IS.
It influences legislation on data registration, safety, copyright and product liability. The society has 3 degrees of members i.e associate, members and fellow.
Members at the 3 levels are accepted according to their qualification.

Some Real World Ethical Dilemma

1. Continental incorporated developed a human resource Db that was able to 'red flag' an employee who was almost retirement age, where the red flag went up the management for the employee even in delay.

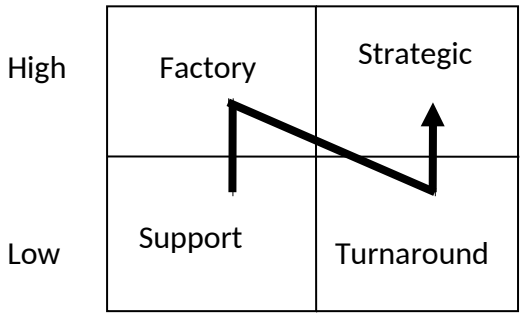
2. AT & T Telephone Company uses technology to monitor employees' responses to customer. It hopes to eliminate 3000 to 6000 employees by identifying speech that is unpractical and summary.

3. E-mail-privacy at Epson – in 1990 an employee of Epson sued the company for $75,000,000 for unlawful termination. She was fired because of questioning the company's policy of monitoring and printing of employees.

4. Mails messages – many firms claim the right to open mail because they own the facility. They are intended for the business only and create this facility for a business purpose.

Other ethical issues concerning technology include;

1. Employment – is have been known to lead to loss of jobs and hence a decline in quality of life.
2. Equity Access and increasing ratio and social classes – Does everyone have an equal opportunity to participate in the digital age? Will the gaps increase or reduce.



Any of the organization in existence has to fall in any of the above four quadrants.

1. Strategic quadrant – information systems planning is critical to the current and future performance of the firm. I.S planning must be closely linked to corporate planning.
2. Turn-round is – information systems planning is very importance to the future performance of the firm, without I.S planning, performance will suffer significantly in the long-run I.S planning must be closely linked to corporate planning.
3. Factory – I.S planning is needed for the information systems activity to be coordinated and to run smoothly. It's important to the current company performance, but it's not expressed to be a critical factor in the future.
4. Support – I.S planning is still needed for the I.S activity to be coordinated and to run smoothly. It's not critical to the current company performance and is very unlikely to be of strategic importance in the future.

Example:

1. Support – this could be an organization that has developed a system to automate some of the clerical procedures and it has no intention of investing in I.T in the near future.
2. Factory – this could be an organization that has developed a network which is quite useful in day-to-day running of company activities and has no intention further in I.T.
3. Turnaround – are organizations that one currently not using I.T. for nay strategic use but there future survival will involve I.T. a lot, such as a university that is contemplating of having a virtual university i.e. African Virtual University (A.V.U).

4. Strategic – e.g a Bank that has invested in ATMs and any future survival in competing effectively is alighted to I.T. e.g. loan portfolio management.

Maslow qualified human wants into a hierarchy of needs. Each lower want or need must be stratified before a worker will seek rewards at the next higher level. Consider the levels starting with the most basic:-

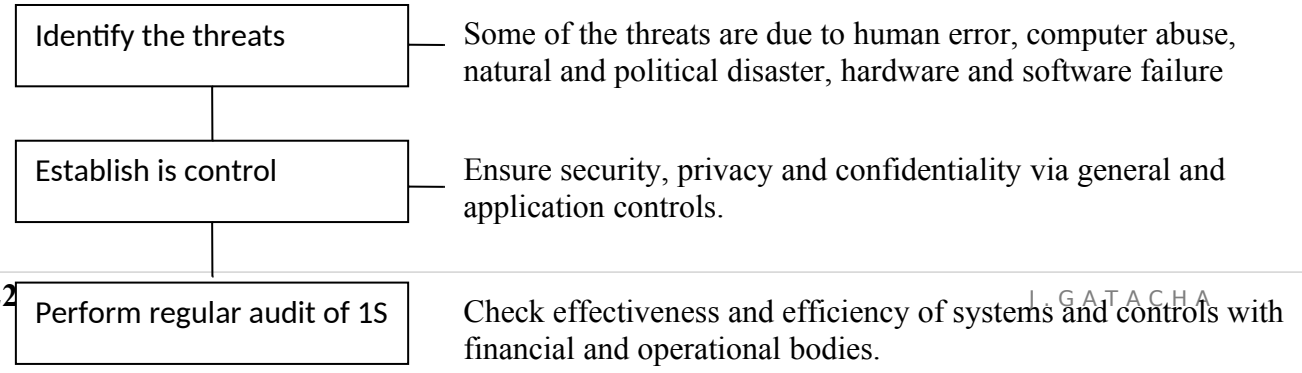
1. Physiological needs – food, clothing and shelter. For the worker this means money. Many workers are willing to work at relatively tedious jobs or at higher production rates given sufficient monetary incentives.
2. Safety or security needs – for the worker this means overall job security. Also at the work site, improving the safety environment will improve the working climate.
3. Social needs – worker seek "belonging" interms of work, this could mean having friendly co-workers, comfortable interaction with management and being able to participate in company's committees.
4. Self –esteem – workers strive for competence, desire some respect and seek to satisfy their egos. This could be provided by making the work more challenging, adding more responsibility and providing greater variety.
5. Self-fulfillment – when all other needs are fulfilled people become satisfied with life.

Computer crime

Information system control, threats to security, privacy and confidentiality in MIS operations

Electronic funds transfer systems, ICU (Intensive Care Unit) and air traffic control systems depend on computers to function reliably and it's estimated that they can't survive a total failure of their information systems processing capacity for longer than a day or two.

The relationship between threats to information systems control can be illustrated as follows:-



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Classes of threats

1. Human error – involves wrong input data, errors in program development or maintenance and operator errors e.g. mislabeling the tapes.
2. Natural and political disasters – includes earthquakes, typhoons, tornados and hurricanes.
3. Failure to hardware and software – e.g. network and power failures and software maintenance.
4. Computer abuse and crime – using a computer to steal, sabotaging the system and authorized access to a modification of data (hacking). Computer crime is any illegal act in which a computer is used as a primary e.g. impersonification i.e. giving access to a system by identifying oneself as one person and therefore enjoys privileges of the legitimate user.

TROJAN HORSE method i.e. conspiring within an authorized programme are routine of actions causing unauthorized actions.
LOGIC BOMB i.e. programme who placed a logic bomb in his companies personnel system such that should his name be upset from the personal file the entire file is erased.

- Computer viruses introduced deliberately.
- Data diddling i.e. changing of data during or before input often to change the contents of the database.
- Salami technique – this is diverting small amounts from large number of accounts maintained by a system.
- Super-zapping – using a system program that can by pass regular system controls to perform unauthorized act e.g. the IBM super-zap utility.
  Super-zaps are provided to handle emergencies in systems such as restoring systems operations after a multifunction that can't be handled with a regular recovery method.
- Scavenging – its unauthorized access to information by searching via the residue after the job has been run on the computer e.g. searching the waste paper basket for printouts etc.
- Wire tapping or carves-dropping
- Spoofing – collecting of confidential information from unsuspecting visitors to the website they visit.
  Having defined controls as a set of policies, procedures and technological measures that are put together an error or an attack of commuter systems from

taking place detect the violation and correct the exceptional situation. These controls can be categorized into general or application controls.

General controls:

1. Administrative – include separation of duties, constant supervision of staff, thorough screening of new employees, published procedures and standards. These can also include disaster recovery planning or contingency planning.
2. System development and maintenance control – systems should be secure and auditable. Documentation should be maintained and should specify changes made to the system.
3. Operational controls – involve controlling access to system, maintenance of computer equipment and storage and the day to day running of the company activities.
4. Physical protection of data centres – e.g. installation of air conditioning equipments, fire extinguishers and UPS (uninterruptable power supply).
5. Controlling access to computer system and information e.g. identification, authentification and encryption. This may use the user's knowledge e.g. the name, account number or password i.e. a smart card with a microprocessor or a biometric control. This is the using of bodily features such as fingerprints, hand geometry (chiromancy) , retrieval scanning and the signature.
6. Control as a last result e.g. adequate insurance for the residual risk or a disaster recovery plan.

Application controls

Implemented specifically for a particular information system e.g. a payroll system, account payable or order processing system. They include;

1. Input control – this is to ensure accuracy, completeness and validation of input.
2. Processing control – e.g. cross-checking two computation which can also include reasonable checks and rounding off.
3. Database controls – these include backups, recovery, file handling and authorization.
4. Communication controls – including encrypting and the use of digital signatures which should also be encrypted.
5. Output controls .e.g. scheduling, handling and distribution.

Auditing of Information Systems

Auditing is the process of verifying organizations accounting records and financial statements. However, this is not possible today without a thorough audit of the information systems which are the primary tools for managing these records. Information systems are audited by external auditors who test the accuracy and the truth of the

corporate financial statements and by internal auditors who work for the organization itself.

Internal auditors also perform operational auditors to evaluate the effectiveness and efficiency of MIS operations.

The principle behind the auditability of information systems is that every transactions must reliably be traceable to the aggregate figures that it affects and each aggregate figure must be traceable back to the transactions which gives rise to it i.e. An audit trail must exist making it possible to trace the origin and verify the processing. Transactions logs provides basic audit trail.

Conducting MIS Audit

MIS auditors generally evaluate the controls on the assumption that if a system has adequate controls that are consistently applied the information produced by these systems is also reliable. Audit can both be scheduled or unscheduled. The process is as follows;-

1. Study the I.S. and its documentation, inputs and outputs then interview the key users and the M.I.S personnel. Study both the general and the application controls.
2. Select a sample of transactions processed by the system and trace their processing from the original document onto the totals they affect. Replicate the processing done by the system and compare it with the result. This is called compliance testing.
3. Validate totals contained in financial records. This is known as substantive testing. The extent of this depends on the compliance results. If controls were operative their only a limited substantive testing would be required.
4. Conclude the audit by reporting the findings to the corporate management with a detailed statement of all the controls deficiencies discovered. The use of computer Aided Auditing Techniques (CAAT) can be applied here.

Why is it necessary to conduct an I.S Audit?

1. Give an assurance of the system reliability e.g. whether the computations are accurate and if there is any likelihood of failure.
2. To search for efficient utilization of computer systems. This confirms that the invested funds produce adequate results i.e. no wastage of resources.
3. Prevention of computer crime. This detects destructive activities such as fraud and computer viruses.
4. Protection of privacy – administrative bodies collect process and store information on individual using computer. Auditing identifies points at which private information may be leaking.

Types of IS audit

1. System development audits: Audit staff advices members of pvy development team to ensure that controls are embedded in the original design.
2. Operational audits – they are periodically conducted on an I.S to ensure that proper system controls exists and that they are being followed. They involve checking input data, processing and output.
3. Application audits – meant to validate the integrity of an I.S. It involves identifying all the controls that govern individuals I.S and access their effectiveness. The auditor needs a thorough understanding of the operations, physical facilities, telecommunication control systems, data security objectives, personnel, organizational structure and manual procedures and individual applications.

Disaster recovery planning /contingency planning

A disaster recovery plan specifies how a company will maintain. The information system necessary in the event of a disaster.

A fire or an explosion in the data centre can bring operations to a standstill. In addition a disaster plan may be required by a regulatory agency or for the purposes of obtaining an insurance cover;-

Importance of contingency planning

1. It enables a company to take a closer look and identify any threats that may hamper its operations.
2. It enables an enterprise to be adequately prepared in the eventuality of realization of the risks.
3. It enables the critical operations to continue in case of a disaster.
4. It eliminates the confusion, uncertainty and panic that results whenever a disaster happens by clearly stating the actions to be undertaken in the event of such a disaster.
5. It facilitates the faster recovery from the disaster thereby reducing the impact.

Steps in drawing a contingency plan

1. Resolve the basic planning issues .e.g. the scope of the plan.
2. Gather important information e.g. the cost of the subject and the case of replacement.
3. Conduct a situation assessment e.g. identity open risks and potential disaster.
4. Identity the planning constraints and limitations.
5. Identify alternative sources of active and select the optimal cause
6. Compile the plan.
7. Conduct a drill for the plan.

A disaster recovery plan has 4 major elements:-

1. An emergency plan – it specifies in what situations a disaster is to be declared and what actions are to be taken by the various employees.
2. A back-up plan – this is a principle component which specified how information processing would be carried out during an emergency. It details how backed up computer disks or tapes are to be maintained and specifies the facility where they can be run on a very short time notice. These arrangements include;-
   (i) Reciprocal arrangement – compares with similar hardware configurations agree with one another to permit short term sharing of the problem by transferring the affected system to the other company before the situation is rectified. Should a disaster occur both companies are forced to reduce their levels of data processing to support only the critical operations.
   Although the method is inexpensive critical operations of the two organizations may be too much for a single one to handle.
   It's also possible for a disaster to strive both companies together.
   (ii) Cold site arrangements – This is a facility that can house a mainframe computer system including environmental control, electrical services and telecommunication services.
   A company may contract with a disaster recovery company to provide a cold site in cases of disaster or may rent, lease, or purchase suitable space.
   (iii) Hot site arrangement – this site contains a complete date centre including a working mainframe system compatible with the one that is backing up. The strategy is expensive but minimizes the down time e.g. a computer bureau. However the company must be aware that a similar disaster can affect several companies at the same time.
   (iv) Back up facilities – A parallel facility where one company has more than one data centre. This is usually an arrangement of real-time systems. The parallel facility has duplicated software and hardware and the database is updated as an ongoing process. This arrangement is the most expensive but would be the best approach.

3. Test plan – This includes drills and practices of what would happen in cases of emergency. It tests the reliability of the back-up plans.

4. Recovery plan – This includes arrangement on purchasing hardware and software to restore the original company. This involves insurance arrangements, loans etc.