B.COM (H) 5th SEMESTER
MANAGEMENT INFORMATION SYSTEMS, PAPER CODE-307

Unit I :-
Information Concepts: Data and Information – Meaning and importance, Relevance of Information in
Decision Making, Sources and Types of Information, Cost Benefit Analysis – Quantitative and Qualitative Aspects, Assessing Information Needs of the Organization.

Unit II:-
System Development: Concept of System, Types of Systems – Open, Closed, Deterministic, Probabilistic,etc. Relevance of Choice of System in MIS, Integration of Organization Systems and Information Systems,System Development Life Cycle, System Analysis, Design and Implementation, MIS Applications in Business.

Unit III:-
Types of information systems: Transaction Processing System, Definition, Purpose, Objectives and Role of MIS in Business Organization with particular reference to Management Levels. MIS Growth andDevelopment, Location of MIS in the Organization – Concept and Design. Decision Support System,
Executive Information System, Expert System, and the recent developments in the Field of MIS.

Unit IV:- Information Technology: Recent Developments in the Field of Information Technology: Multimedia Approach to Information Processing. Decision of Appropriate Information Technology for proper MIS.Choice of Appropriate IT Systems – Database, Data warehousing & Datamining Concepts, Centralised and Distributed Processing.

UNIT -1 INFORMATION CONCEPTS

Data and Information

Data : Data is raw facts. Data is like raw material. Data does not interrelate and also it does not help in decision making. Data is defined as groups of non-random symbols in the form of text, images, voice representing quantities, action and objects.
Information : Information is the product of data processing. Information is interrelated data. Information is equivalent to finished goods produced after processing the raw material. The information has a value in decision making. Information brings clarity and creates an intelligent human response in the mind.
According to Davis and Olson : —Information is a data that has been processed into a form that is meaningful to recipient and is of real or perceived value in the current or the prospective action or decision of recipient.

Characteristics of Information :

The parameters of a good quality are difficult to determine for information. Quality of information refers to its fitness for use, or its reliability. Following are the essential characteristic features :

i) **Timeliness :** Timeliness means that information must reach the recipients within the prescribed timeframes. For effective decision-making, information must reach the decision-maker at the right time, i.e. recipients must get information when they need it. Delays destroys the value of information. The characteristic of timeliness, to be effective, should also include up-to-date, i.e. current informationii) ii)**Accuracy :** Information should be accurate. It means that information should be free from mistakes, errors &, clear. Accuracy also means that the information is free from bias. Wrong information given to management would result in wrong decisions. As managers decisions are based on the information supplied in MIS reports, all managers need accurate information.
iii) **Relevance :** Information is said to be relevant if it answers especially for the recipient what, why, where, when, who and why? In other words, the MIS should serve reports to managers which is useful and the information helps them to make decisions..
iv) **Adequacy :** Adequacy means information must be sufficient in quantity, i.e. MIS must provide reports containing information which is required in the deciding processes of decision-making. The report should not give inadequate or for that matter, more than adequate information, which may create a difficult situation for the decision-maker. Whereas inadequacy of information leads to crises, information overload results in chaos.
v) **Completeness :** The information which is given to a manager must be complete and should meet all his needs. Incomplete information may result in wrong decisions and thus may prove costly to the organization.
vi) **Explicitness :** A report is said to be of good quality if it does not require further analysis by the recipients for decision making.
vii) **Impartiality :** Impartial information contains no bias and has been collected without any distorted view of the situation.

Data are plain facts. When data are processed, organized, structured or presented in a given context so as to make them useful, they are called Information. It is not enough to have data in themselves are fairly useless. But when these data are interpreted and processed to determine its true meaning, they become useful and can be called Information.

As an example, suppose that you want to know how you're doing in a particular course. So far, you've taken two 20-question multiple-choice tests. On the first, you got questions 8, 11, and 14 wrong; on the second, you did worse, missing items 7, 15, 16, and 19. The items that you got wrong are merely data—unprocessed facts. What's important is your total score. You scored 85 on the first exam and 80 on the second. These two numbers constitute information—data that have been processed, or turned into some useful form.

Importance of information system:

(i) Ability to process data into information with accuracy and high speed. It involves complex computation, analysis, comparisons and summarization.
(ii) Organizing and updating of huge amount of raw data of related and unrelated nature, derived from internal and external sources at different periods of time.
(iii) The information processing and computer technology have been so advanced that managers are able to obtain real time information about ongoing activities and events without any waiting period.
(iv) The input data in computer can be converted into different output formats for a variety of purpose. The system is so organized that managers at different levels and in different activity units are in a position to obtain information in whatever form they want , provided that relevant " Programmers" or instructions have been designed for the purpose.
(v) Super-human memory, tremendous volume of data and information and the set of instructions can be stored in the computer and can be retrieved as and when needed. Management can get bit of stored information from the computer in seconds.

Relevance of Information in Decision Making:

The word —**decision** —is derived from the Latin word —decido‖. Which means —A decision, therefore is
A Settlement
A fixed intuition to bringing to a conclusive result
A judgment
A resolution

Decision : A decision is the choice out of several options made by the decision maker to achieve some objective in a given situation.
Business Decision : Business decisions are those which are made in the process of conducting business to achieve its objective in a given situation.

Characteristic of Business Decision Making :
a) Sequential in nature.
b) Exceedingly complex due to risk and trade off.
c) Influenced by personal values.

d) Made in institutional setting and business environment.

Rational Decision Making: A rational decision is the one which, effectively and efficiently, ensure the achievement of the goal for which the decision is made .In reality there is no right or wrong decision but a rational decision or irrational decision which depends on situation.

Type of Rationality:
Objectively: Maximum the value of the objectives.
Subjective: If it is minimize the attainment of value in relation to the knowledge and awareness of subject.
Consciously: Extent the process of the decision making is a conscious one
Organizationally: degree of the orientation towards the organization.
Personal: Rational to the extent is achieves an individual's personal reason (goals).

Type of Decision Making System: There are two types of decision making system on the basis of knowledge about the environment.
(i) **Closed:** If the manager operates in a known environment then it is called closed decision making system.
Conditions:
a) Manager knows the set of decision alternative and know their outcome in term of values.
b) Manager has a model, by which decision alternatives can be generated, tested and ranked.
c) The manager can choose one of them, based on some goal or objective.

(ii) **Open:** If the manager operates in unknown environment then it is called open decision making.
Conditions:
a) Manager does not know all alternatives.
b) Outcome is not known.
c) No methods or models are used.
d) Decide objective or goal; select one where his aspirates or desire are met best.

Types of Decision: Types of decision are based on the degree of knowledge about the out come of the events which are yet to take place.
Certainty: If the manager has full knowledge of event or outcome then it is a situation of certainty.
Risk: If the manager has partial knowledge or probabilistic knowledge then it is decision under risk.
Uncertainty: If the manager does not have any knowledge, it is decision making under uncertainty
MIS converts the uncertainty to risk and risk to certainty. The decision at the low level management is certain, at middle level of the management the decision is under risk and at the top level management the decision is in under uncertain.
Nature of decision: Decision making is a complex task. To resolve the complexity the nature of decision are of two types:

Programmed and Non-Programmed Decision:
a) If a decision can be based on a rule, methods or even guidelines, it is called the programmed decision.
b) A decision which cannot be made by using a rule or model is the non-programmed decision.

Decision Support System refers to a class of systems which support in the process of decision making and does not always give a decision itself.
Decision Support Systems (DSS) are a specific class of computerized information system that supports business and organizational decision-making activities. A properly designed DSS is an interactive
software-based system intended to help decision makers compile useful information from raw data, documents, personal knowledge, and/or business models to identify and solve problems and make decisions
DSS is an application of Hebert Simon model, as discussed, the model has three phases**:**
i) Intelligence
ii) Design
iii) Choice **30**

The DSS basically helps in the information system in the intelligence phase where the objective is to identify the problem and then go to the design phase for solution. The choice of selection criteria varies from problem to problem.
It is therefore, required to go through these phases again and again till satisfactory solution is found.
In the following three phase cycle, you may use inquiry, analysis, and models and accounting system to come to rational solution.
These systems are helpful where the decision maker calls for complex manipulation of data and use of several methods to reach an acceptable solution using different analysis approach. The decision support system helps in making a decision and also in performance analysis. DSS can be built around the rule in case of programmable decision situation. The rules are not fixed or predetermined and requires every time the user to go through the decision making cycle as indicated in Herbert Simon model.

Attributes:
i) DSS should be adaptable and flexible.
ii) DSS should be interactive and provide ease of use.
iii) Effectiveness balanced with efficiency (benefit must exceed cost).
iv) Complete control by decision-makers.
v) Ease of development by (modification to suit needs and changing environment) end users.
vi) Support modeling and analysis.
vii) Data access.
viii) Standalone, integration and Web-based

DSS Characteristics:
i) Support for decision makers in semi structured and unstructured problems.
ii) Support managers at all levels.
iii) Support individuals and groups.
iv) Support for interdependent or sequential decisions.
v) Support intelligence, design, choice, and implementation.
vi) Support variety of decision processes and styles

Sources and Types of Information:-

Methods of Data and Information Collection: Several methods are available for the collection of data. The choice of method will have an impact on the quality of information. Similarly the design of data collection method also decides the quality of data and information.
Following are the **methods** of data collection:
i) Observation
ii) Experiment
iii) Survey
iv)Subjective Estimation
v) Transaction Processing
vi)Purchase from Outside
vii) Publication
viii) Government Agencies

An **information source** is a source of information for somebody, i.e. anything that might inform a person about something or provide knowledge about it. Different types of questions require different sources of information. Information sources may be observations, people, speeches, documents, pictures, organizations, websites, etc. They may be primary sources, secondary sources and tertiary sources and so on.

Primary sources are original materials. Information for which the writer has no personal knowledge is not primary, although it may be used by historians in the absence of a primary source. In the study of history as an academic discipline, a primary source (also called **original source** or **evidence**) is an artifact, a document, a recording, or other source of information that was created at the time under study. It serves as an original source of information about the topic. Similar definitions are used in library science, and other areas of scholarship. In journalism, a primary source can be a person with direct knowledge of a situation, or a document written by such a person

Secondary source is a document or recording that relates or discusses information originally presented elsewhere. A secondary source contrasts with a primary source, which is an original source of the information being discussed; a primary source can be a person with direct knowledge of a situation, or a document created by such a person.
Secondary sources involve generalization, analysis, synthesis, interpretation, or evaluation of the original information. *Primary* and *secondary* are relative terms, and some sources may be classified as primary or secondary, depending on how it is used. An even higher level, the

tertiary source, such as an encyclopedia or dictionary, resembles a secondary source in that it contains analysis, but attempts to provide a broad introductory overview of a topic

A **tertiary source** is an index and/or textual condensation of primary and secondary sources.
Some examples of tertiary sources are almanacs, guide books, survey articles, timelines, and user guides. Depending on the topic of research, a scholar may use a bibliography, dictionary, or encyclopedia as either a tertiary or a secondary source.
As tertiary sources, encyclopedias and textbooks attempt to summarize and consolidate the source materials into an overview, but may also present subjective commentary and analysis (which are characteristics of a secondary source).
In some academic disciplines the distinction between a secondary and tertiary source is relative but in historiography it is absolute.
In the UNISIST model, a secondary source is a bibliography, whereas a tertiary source is a synthesis of primary sources

A business has several information systems:
(A) Formal Information System
(B) Informal Information System
(C) Computer Based Information System

Formal Information System: It is based on organizational chart represented by the organization.

Informal Information System: It is an employee based system designed to meet personal and vocational needs and to help in the solution of work-related problems. It also funnels information upward through indirect channels. It works within the framework of the business and its stated policies.

Computer Based Information System (CBIS) : This category of information system depends mainly on the computer for handling business application. System analysis develops different types of information system to meet variety of business needs. There is class of system collectively known as computer based information system. They can be classified as **:**
Transaction Processing System (TPS)
Management Information System (MIS)
Decision Making System (DSS)
Office Automation System (OAS)

Cost Benefit Analysis –Quantitative and Qualitative Aspects:

The valuation of benefits and costs should reflect preferences revealed by choices which have been made. For example, improvements in transportation frequently involve saving time. The question is how to measure the money value of that time saved. The value should not be merely what transportation planners think time should be worth or even what people say their time is worth. The value of time should be that which the public reveals their time is worth through choices involving tradeoffs between time and money. If people have a choice of parking close to their destination for a fee of 50 cents or parking farther away and spending 5 minutes more walking and they always choose to spend the money and save the time and effort then they have

revealed that their time is more valuable to them than 10 cents per minute. If they were indifferent between the two choices they would have revealed that the value of their time to them was exactly 10 cents per minute.

The most challenging part of CBA is finding past choices which reveal the tradeoffs and equivalencies in preferences. For example, the valuation of the benefit of cleaner air could be established by finding how much less people paid for housing in more polluted areas which otherwise was identical in characteristics and location to housing in less polluted areas. Generally the value of cleaner air to people as revealed by the hard market choices seems to be less than their rhetorical valuation of clean air.

In order for the business case to have the best chance of securing the desired funds, a significant portion of the proposal should focus on the quantitative aspects of proposed projects, as opposed to the qualitative characteristics. Quantitative analysis focuses on measurable numeric data while qualitative analysis is based on observed characteristics that are difficult to measure. An example of qualitative data associated with a software implementation would be the cost of savings realized, while an example of qualitative data could be improved employee morale.

Assessing Information Needs of the Organization.

To facilitate the management decision making at all levels of company, the MIS must be integrated. MIS units are company wide. MIS is available for the Top management. The top management of company should play an active role in designing, modifying and maintenance of the total organization wide management information system.

Information system and Information technology have become a vital component of any successful business and are regarded as major functional areas just like any other functional area of a business organization like marketing, finance, production and HR. Thus it is important to understand the area of information system just like any other functional area in the business. MIS is important because all businesses have a need for information about the tasks which are to be performed. Information and technology is used as a tool for solving problems and providing opportunities for increasing productivity and quality. Information has always been important but it has never been so available, so current and so overwhelming. Efforts have been made for collection and retrieval of information, However, challenges still remain in the selection analysis and interpretation of the information that will further improve decision making and productivity.

MIS for a Business Organization:

Support the Business Process: Treats inputs as a request from the customer and outputs as services to customer. Supports current operations and use the system to influence further way of working.

Support Operation of a Business Organization: MIS supports operations of a business organization by giving timely information, maintenance and enhancement which provides flexibility in the operation of an organization.

To Support Decision Making: MIS supports the decision making by employee in their daily operations. MIS also supports managers in decision making to meet the goals and objectives of the organization. Different mathematical models and IT tools are used for the purpose evolving strategies to meet competitive needs.

Strategies for an Organization: Today each business is running in a competitive market. MIS supports the organization to evolve appropriate strategies for the business to assent in a competitive environment.

Dimensions of Information: There are three most common dimensions of information for MIS
(i) **Economic Dimension:** Economic dimension of information refers to the cost of information and its benefits. Generation of information costs money. Measuring cost and benefit of information is difficult because of intangible characteristic of information.
Cost of Information: Cost of information may include: Cost of acquiring data, Cost of maintaining data, Cost of generating information and Cost of communication information. Costs related to the response time require generating information and communicating it. Thus, for **system with low response time, the cost is high.** The cost is depends on accuracy, speed of generation etc.
Value of Information: Information has a cost for its acquisition and maintenance. Thus before a particular piece of information is acquired, decision maker must know its value. The information has a perceived value in terms of decision making. The decision maker feels more secured when additional information is received in case of decision making under uncertainty or risk.
Perfect Information: The information is called a **Perfect Information,** if it wipes out uncertainty or risk completely. However, perfect information is a myth.

The value of information is the value of the change in decision behavior because of the information. The change in the behavior due to new information is measured to determine the benefit from its use. To arrive at the value of information, the cost incurred to get this information is deducted from the benefit.
Value of information = Cost to get information-benefit
Given a set of possible decisions, a decision maker will select one on the basis of the available information. If the new information causes a change in the decision, then the value of information is the difference in the value between outcome of the old decision and that of new decision, less the cost obtaining the new information. The value of the additional information making the existing information perfect (VPI) is: **VPI = (V2 - V1) - (C2 - C1)** Where V is the value of the information and C is the cost of obtaining the information. V1 and C1 relate to one set of information V2, C2 relate to the new set. In MIS, the concept of the value of information is used to find out the benefit of perfect information and if the value is significantly high, the system should provide it. If the value is insignificant, it would not be worth collecting the additional information.

(ii) **Business Dimension:** Different types of information are required by managers at different levels of the management hierarchy. The information needs of managers at strategic planning level are altogether different that those of operational control managers. It is because of the fact that managers at different levels are required to perform different functions in an organization.
(iii) **Technical Dimension:** This dimension of information refers to the technical aspects of the database. It includes the capacity of database, response time, security, validity, data interrelationship etc.

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UNIT –2 SYSTEM DEVLOPMENT

Concept of System:-

The word system is derived from the Greek word ―system‖ which means a organized relationship among the following unit or component.

"A system is an orderly grouping of interdependent components linked together according to a plan to achieve a specific goal."

The word component may refer to physical parts (engine, wheels of cars), management steps (planning, organizing, controlling) or a sub subsystem in a multi level structure. It is to be noted that a system is not a randomly arranged set. It is arranged with some logic governed by rules, regulation, principles and policies.

In MIS we are usually concerned with man-made system involving input, process and output, as represented in figure. A system may have multiple inputs and multiple outputs.

All systems operate in an environment. The environment may influence the system in its design and performance. When a system is designed to achieve certain objective, it automatically sets the boundaries for itself. The understanding of boundaries of the system is essential to bring clarity in explaining the system components and their arrangement.

Characteristics of System:

Following characteristics are present in all systems:

a) Organization
b) Interaction
c) Interdependence
d) Integration
e) Central Objective

Organization: Organization implies structure and order. It is the arrangement of components that helps to achieve objectives. Hierarchical relationship starting with the president on top and leading down ward to the blue collar worker represent the organization structure

Interaction: Interaction refers to the procedure in which each component interact with other components of the system. In an organization, for example purchasing must interact with product, advertising with sales and payroll with personnel.

Interdependence: Independence is concerned with how a system is tied together; it is more than sharing a physical part or location. It means that parts of the system part or location with in the system, even through each part performance. A unique function successful integration will typically produce a better request as whole rather than if each component works independently.

Central Objective: Objective may be real or stated. Objective is determined by higher management and user must be aware about the central objective well in advance.

Types of Systems – Open, Closed, Deterministic, Probabilistic, etc:-

Physical or Abstract : Physical system is tangible entities that may be static or dynamic in nature. Abstract system is conceptual or non-physical. The abstract is conceptualization of physical situations.

Open and Closed: An open system continually interacts with its environment. It receives input from the outside and delivers output to outside. A closed system is isolated from environment influences.

Sub System and Super System: Each system is part of a large system. The business firm is viewed as the system or total system when focus is on production, distribution of goal and sources of profit and

income. The total system consists of all the objects, attributes and relationship necessary to accomplish an objective given a number of constraints.

Sub systems are the smaller systems within a system. Super system denotes extremely large and complex system

Permanent and Temporary System: A permanent system is a system enduring for a time span that is long relative to the operation of human. Temporary system is one having a short time span.

Natural and Man Made System: System which is made by man is called man made system. Systems which are in the environment made by nature are called natural system.

Deterministic and Probabilistic: A Deterministic system is one in which the occurrence of all events is perfectly predictable. If we get the description of the system state at a particular time, the next state can be easily predicted.

Probabilistic system is one in which the occurrence of events cannot be perfectly predicted.

Man-made Information System: It is generally believed that the information reduces uncertainty about a state or event. An information system is the basis for interaction between the user and the analyst. It determines the nature of relationship among decision makers.

An information system may be defined as a set of devices, procedures and operating system designed around user-base criteria to produce information and communicating it to the user for planning control and performance.

Relevance of Choice of System in MIS:-

The four alternatives to in-house development by IT specialists are outsourcing, licensing, using software as a service (SaaS), and having the users develop the system. If an application of the desired features and quality can be obtained from more than one of the resources, then the major factor left to be considered is usually cost. The preference then would be to license, because of immediate availability and low cost. If the application cannot be licensed, the next choice would usually be to obtain the use of the system as a service from an application service provider (ASP) because the system is immediately available for use and the organization does not have to lay out a large sum up front for such use. If ASPs do not offer the desired IS and it can be developed by non IT employees, then this would usually be the chosen alternative. If non-IT employees cannot develop the IS, the choice might then be to outsource IS development.

Outsourcing

Outsourcing in general means hiring the services of another organization or individual to perform some of the work that otherwise would be performed by you or your employees. In the IT arena, **Outsourcing** has two meanings. One is to commission the development of an application to another organization, usually a company that specializes in the development of this type of organization. The other is to hire the services of another company to manage all or parts of the services that otherwise would be rendered by an IT unit of the organization.

Outsourcing Custom-Designed Applications

Often, an organization has a need that no existing software can satisfy. For example, if the cost-accounting procedures of a particular company are so specific that no commercially available software can perform them, the company must develop **Custom-designed** or **tailored software.**

Advantage

Good fit of features to business needs
Good fit of features to organizational culture
Personnel available for maintenance
Smooth interfaces with other information systems
Availability of special security measures
Potential for a strategic advantage

Disadvantages

High Cost
Long wait for development if IS personnel are busy with other projects
Applications may be too organization-specific to interface with systems of other organizations
Many North American and European countries have outsourced development of well-defined applications to professionals in other countries, an act often referred to as **off shoring.**

Outsourcing IT Services

In considering whether to outsource IT services, management should ask the following questions:
What do we do outside out specialties that could be done better for us by organizations specializing in that area?

Integration of Organization Systems and Information Systems:-

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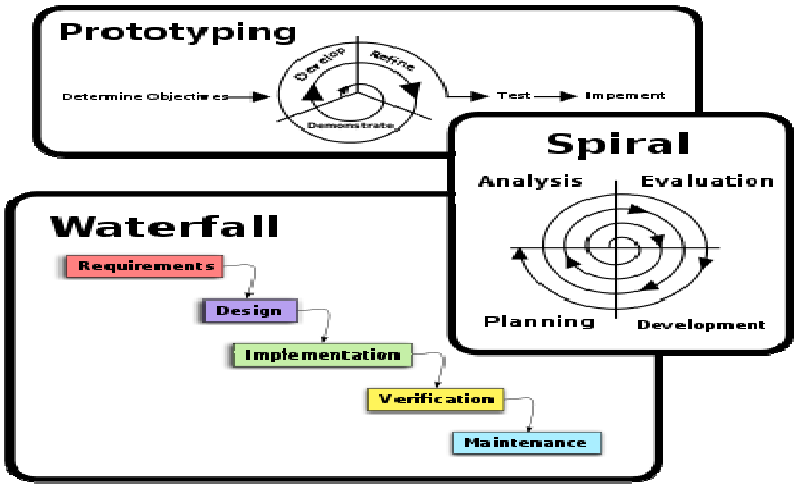
System Development Life Cycle:- System Analysis, Design and Implementation

Software development methodology

A software development methodology or system development methodology in software engineering is a framework that is used to structure, plan, and control the process of developing information system.



The three basic approaches applied to software development methodology frameworks.
A wide variety of such frameworks have evolved over the years, each with its own recognized strengths and weaknesses. One software development methodology framework is not necessarily suitable for use by all projects. Each of the available methodology frameworks are best suited to

specific kinds of projects, based on various technical, organizational, project and team considerations.
These software development frameworks are often bound to some kind of organization, which further develops, supports the use, and promotes the methodology framework. The methodology framework is often defined in some kind of formal documentation. Specific software development methodology frameworks (noun) include:

Waterfall development
The Waterfall model is a sequential development approach, in which development is seen as flowing steadily downwards (like a waterfall) through the phases of requirements analysis, design, implementation, testing (validation), integration, and maintenance.
The basic principles are:

- Project is divided into sequential phases, with some overlap and splashback acceptable between phases.
- Emphasis is on planning, time schedules, target dates, budgets and implementation of an entire system at one time.
- Tight control is maintained over the life of the project via extensive written documentation, formal reviews, and approval/signoff by the user and information technology management occurring at the end of most phases before beginning the next phase.

The Waterfall model is a traditional engineering approach applied to software engineering. It has been widely blamed for several large-scale government projects running over budget, over time and sometimes failing to deliver on requirements due to the Big Design Up Front approach. Except when contractually required, the Waterfall model has been largely superseded by more flexible and versatile methodologies developed specifically for software development. See Criticism of Waterfall model.

Prototyping

Software prototyping is the development approach of activities during software development, the creation of prototypes, i.e., incomplete versions of the software program being developed.
The basic principles are:

- Not a standalone, complete development methodology, but rather an approach to handle selected parts of a larger, more traditional development methodology (i.e. incremental, spiral, or rapid application development (RAD)).
- Attempts to reduce inherent project risk by breaking a project into smaller segments and providing more ease-of-change during the development process.
- User is involved throughout the development process, which increases the likelihood of user acceptance of the final implementation.
- Small-scale mock-ups of the system are developed following an iterative modification process until the prototype evolves to meet the users' requirements.
- While most prototypes are developed with the expectation that they will be discarded, it is possible in some cases to evolve from prototype to working system.
- A basic understanding of the fundamental business problem is necessary to avoid solving the wrong problem.

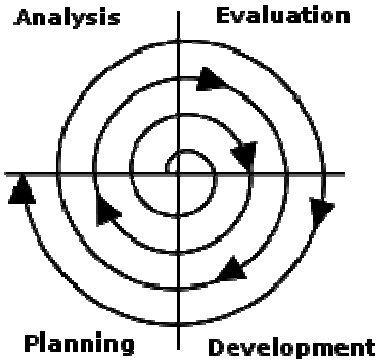
Incremental development

Various methods are acceptable for combining linear and iterative systems development methodologies, with the primary objective of each being to reduce inherent project risk by breaking a project into smaller segments and providing more ease-of-change during the development process.

The basic principles are:

- A series of mini-Waterfalls are performed, where all phases of the Waterfall are completed for a small part of a system, before proceeding to the next increment, or
- Overall requirements are defined before proceeding to evolutionary, mini-Waterfall development of individual increments of a system, or
- The initial software concept, requirements analysis, and design of architecture and system core are defined via Waterfall, followed by iterative Prototyping, which culminates in installing the final prototype, a working system.

Spiral development



The spiral model is a software development process combining elements of both design and prototyping-in-stages, in an effort to combine advantages of top-down and bottom-up concepts. It is a meta-model, a model that can be used by other models.

The basic principles are:

- Focus is on risk assessment and on minimizing project risk by breaking a project into smaller segments and providing more ease-of-change during the development process, as well as providing the opportunity to evaluate risks and weigh consideration of project continuation throughout the life cycle.
- "Each cycle involves a progression through the same sequence of steps, for each part of the product and for each of its levels of elaboration, from an overall concept-of-operation document down to the coding of each individual program."
- Each trip around the spiral traverses four basic quadrants: (1) determine objectives, alternatives, and constraints of the iteration; (2) evaluate alternatives; Identify and resolve risks; (3) develop and verify deliverables from the iteration; and (4) plan the next iteration.
- Begin each cycle with an identification of stakeholders and their win conditions, and end each cycle with review and commitment.

Rapid application development

Rapid application development (RAD) is a software development methodology, which involves iterative development and the construction of prototypes. Rapid application development is a term originally used to describe a software development process introduced by James Martin in 1991.

The basic principles are:

- Key objective is for fast development and delivery of a high quality system at a relatively low investment cost.
- Attempts to reduce inherent project risk by breaking a project into smaller segments and providing more ease-of-change during the development process.
- Aims to produce high quality systems quickly, primarily via iterative Prototyping (at any stage of development), active user involvement, and computerized development tools. These tools may include Graphical User Interface (GUI) builders, Computer Aided Software Engineering (CASE) tools, Database Management Systems (DBMS), fourth-generation programming languages, code generators, and object-oriented techniques.
- Key emphasis is on fulfilling the business need, while technological or engineering excellence is of lesser importance.
- Project control involves prioritizing development and defining delivery deadlines or "timeboxes". If the project starts to slip, emphasis is on reducing requirements to fit the timebox, not in increasing the deadline.
- Generally includes joint application design (JAD), where users are intensely involved in system design, via consensus building in either structured workshops, or electronically facilitated interaction.
- Active user involvement is imperative.
- Iteratively produces production software, as opposed to a throwaway prototype.
- Produces documentation necessary to facilitate future development and maintenance.
- Standard systems analysis and design methods can be fitted into this framework.

MIS Applications in Business.

An information system (IS) is the concept of integrating computer technology in a business or organization. An information system can be small or large, and designed for any type of business or organization. Information systems are the main thrust of automating a department, division or branch which depends on data to make decisions, produce products or goods, perform logistical functions and develop software.

Executive Management

- At the executive management level, business information systems are designed to find solutions to corporate problems and provide a decision support system based on project scenarios. An information system can assist in determining scenarios such as mergers and acquisitions, and streamline the strategic planning process. Executive managers such as a Chief Operations Officer (COO) or Chief Financial Officer can make corporate decisions based on data provided by the IS. At the executive level, the focus of information systems is quality assurance and return on investment (ROI).

Operations Management

- The role of information systems in operations management is critical. Operations management is the heart of any corporation or business. In operations management, information systems design can apply to production control, research, development, and manufacturing. Even though these processes or departments are separate, information systems can integrate these processes to work efficiently to produce desired results of a product or service.

Human Resources

- Human resources management relies on information systems to maintain employee records, benefits information and historical information regarding employees. Information systems applications in the area of human resources can integrate employee data into several processes used by human resource managers or personnel to process important data concerning employees. IS has applications for conducting research, workforce projections and mandates for compliance in labor relations.

Logistics Management

- Logistics management includes processes of shipping, receiving or developing a structure for products or services. Information systems support logistical processes in various ways, such as real time inquiries to track an item from the point of shipment, receiving and storage of the item and inventory status of the item. The information system enhances services such as the tracking of goods on a transportation route and the arrival time of goods through a computerized tracking number. Most freight carriers such as United Parcel Service (UPS) and Federal Express (FedEx) use elaborate information systems to manage their logistical process.

Data Administration and Design

- For businesses with "in-house" data processing function, information systems can provide the structure for programmers, database managers and data administrators to collaborate on new and existing projects. An information system can be partitioned into different areas while at the same time, through data security, allowing employees in computer operations to work on data or software development projects together.

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UNIT -3 TYPE OF INFORMATION

Introduction: Definition, Purpose, Objectives and Role of MIS in Business Organization with particular reference to Management Levels

Management Information Systems (MIS), referred to as Information Management and Systems, is the discipline covering the application of people, technologies, and procedures collectively called information systems, to solving business problems.

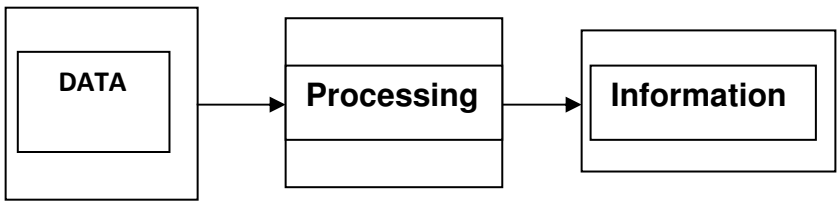
"'MIS' is a planned system of collecting, storing and disseminating data in the form of information needed to carry out the functions of management."

Academically, the term is commonly used to refer to the group of information management methods tied to the automation or support of human decision making, e.g. Decision Support Systems, Expert Systems, and Executive Information Systems.

Management: Management is art of getting things done through and with the people in formally organized groups. The basic functions performed by a manager in an organization are: Planning, controlling, staffing, organizing, and directing.

Information: Information is considered as valuable component of an organization. Information is data that is processed and is presented in a form which assists decision maker.

System: A system is defined as a set of elements which are joined together to achieve a common objective. The elements are interrelated and interdependent. Thus every system is said to be composed of subsystems. A system has one or multiple inputs, these inputs are processed through a transformation process to convert these input(s) to output.



Information Generation

System: A system is defined as a set of elements which are joined together to achieve a common objective. The elements are interrelated and interdependent. Thus every system is said to be composed of subsystems. A system has one or multiple inputs, these inputs are processed through a transformation process to convert these input(s) to output.

Structure Of MIS:-

Structure of MIS may be understood by looking at the physical components of the information system in an organization. The physical components of an organizational information system may be hardware, software, database, manual procedures and operating persons. A brief description of these components has been outlined in the following paragraphs:-

Hardware
Hardware refers to the physical data processing equipment and peripheral devices, For example, CPU, monitor, keyboard, printer, drives, tapes, communication devices, etc.

Software
Software is a broad term given to the instructions or programs that direct the operating of the hardware. Software could be of two types, i.e. system software and application software.

Database
The database consists of all data utilized by application software. Data is stored in files.

Procedures
Formal operating procedures, which are required to operate a system, such as manuals, are also regarded as physical elements.

Operating Personnel
Personnel like Computer Operators, Computer Programmers, System Analysts, System Managers, etc., are the operating people of the information systems.

Input and Output
Various physical inputs and outputs from the information system, existing in forms like printout, reports etc.

Objectives of MIS :

Data Capturing: MIS capture data from various internal and external sources of organization. Data capturing may be manual or through computer terminals.

Processing of Data : The captured data is processed to convert into required information. Processing of data is done by such activities as calculating, sorting, classifying, and summarizing.

Storage of Information: MIS stores the processed or unprocessed data for future use. If any information is not immediately required, it is saved as an organization record, for later use.

Retrieval of Information: MIS retrieves information from its stores as and when required by various users.

Dissemination of Information: Information, which is a finished product of MIS, is disseminated to the users in the organization. It is periodic or online through computer terminal.

Characteristics of MIS:

Systems Approach: The information system follows a systems approach. Systems approach means taking a comprehensive view or a complete look at the interlocking sub-systems that operate within an organization.

Management Oriented: Management oriented characteristic of MIS implies that the management actively directs the system development efforts. For planning of MIS, top-down approach should be followed. Top down approach suggests that the system development starts from the determination of management's needs and overall business objective. To ensure that the implementation of system's polices meet the specification of the system, continued review and participation of the manager is necessary.

Need Based: MIS design should be as per the information needs of managers at different levels.
Exception Based: MIS should be developed on the exception based also, which means that in an abnormal situation, there should be immediate reporting about the exceptional situation to the decision –makers at the required level.
Future Oriented: MIS should not merely provide past of historical information; rather it should provide information, on the basis of future projections on the actions to be initiated.
Integrated: Integration is significant because of its ability to produce more meaningful information. Integration means taking a comprehensive view or looking at the complete picture of the interlocking subsystems that operate within the company.
Common Data Flow: Common data flow includes avoiding duplication, combining similar functions and simplifying operations wherever possible. The development of common data flow is an economically sound and logical concept, but it must be viewed from a practical angle.
Long Term Planning: MIS is developed over relatively long periods. A heavy element of planning should be involved.
Sub System Concept: The MIS should be viewed as a single entity, but it must be broken down into digestible sub-systems which are more meaningful.
Central database: In the MIS there should be common data base for whole System

Salient Features of Computer which makes it an essential components of MIS

Characteristics of Computerized MIS :
(i) Ability to process data into information with accuracy and high speed. It involves complex computation, analysis, comparisons and summarization.
(ii) Organizing and updating of huge amount of raw data of related and unrelated nature, derived from internal and external sources at different periods of time.
(iii) The information processing and computer technology have been so advanced that managers are able to obtain real time information about ongoing activities and events without any waiting period.
(iv)The input data in computer can be converted into different output formats for a variety of purpose. The system is so organized that managers at different levels and in different activity units are in a position to obtain information in whatever form they want , provided that relevant " programs" or instructions have been designed for the purpose.
(v) Super-human memory, tremendous volume of data and information and the set of instructions can be stored in the computer and can be retrieved as and when needed. Management can get bit of stored information from the computer in seconds.

Organizational Need for MIS in a Company
To facilitate the management decision making at all levels of company, the MIS must be integrated. MIS units are companywide. MIS is available for the Top management. The top management of company should play an active role in designing, modifying and maintenance of the total organization wide management information system. Information system and Information technology have become a vital component of any successful business and are regarded as major functional areas just like
any other functional area of a business organization like marketing, finance, production and HR. Thus it is important to understand the area of information system just like any other functional area in the business. MIS is important because all businesses have a need for information about

the tasks which are to be performed. Information and technology is used as a tool for solving problems and providing opportunities for increasing productivity and quality. Information has always been important but it has never been so available, so current and so overwhelming. Efforts have been made for collection and retrieval of information, However, challenges still remain in the selection analysis and interpretation of the information that will further improve decision making and productivity.

Location of MIS in the Organization – Concept and Design

MIS for a Business Organization :

Support the Business Process : Treats inputs as a request from the customer and outputs as services to customer. Supports current operations and use the system to influence further way of working.

Support Operation of a Business Organization: MIS supports operations of a business organization by giving timely information, maintenance and enhancement which provides flexibility in the operation of organizations.

To Support Decision Making: MIS supports the decision making by employee in their daily operations. MIS also supports managers in decision making to meet the goals and objectives of the organization. Different mathematical models and IT tools are used for the purpose evolving strategies to meet competitive needs.

Strategies for an Organization: Today each business is running in a competitive market. MIS supports the organization to evolve appropriate strategies for the business to assented in a competitive environment.

Essential Requirement of an Effective MIS:

(i) **Qualified System and Management Staff:** The prerequisite of an effective MIS is that it should be managed by qualified officers. These officers should have a mutual understanding about the roles and responsibilities of each other. Understand clearly the view of their fellow officers. For this, each organization should have two categories of officers:

(a) **System and Computer Experts** who in addition to their expertise in their subject area , they should also be capable of understanding management concepts to facilitate the understanding of problems asked by concern. They should also be clear about the process of decision making and information requirements for planning.

(b) **Management experts** who should also understand quite-clearly the concepts and operations of a computer. This basic knowledge of computer will be useful will place them in a comfortable position, while working with systems, technicians in designing or otherwise, of the information system.

(ii) **Futuristic Perspective:** An effective MIS should be capable of meeting the future requirements of its executives as well. This capability can be achieved by regular monitoring and updating the MIS.

(iii) **Support of Top Management:** For a management information system to be effective, it must receive the full support of top management. The Reasons for this are **:**

(a) Subordinate managers are usually lethargic about activities which do not receive the support of their superiors.

(b) The resources involved in computer based information system are larger and are growing larger and larger in view of importance gained by management information system.

(iv) **Common Database:** It is an integrated collection of data and information which is utilized by several information subsystems of an organization. A common database may be defined as a super file which consolidates and integrates data records formerly stored in a separate data file. Such a database can be organized as an integrated collection of data records into a single super file or it can be organized as an integrated collection of several data file.
(v) **Control and maintenance of MIS:** Control of the MIS means the operation of the system as it was designed to operate. Sometimes, users develop their own procedures or short cut methods to use the system which reduces its effectiveness.

MIS Growth and Development

Factors responsible for Development of MIS
Factors Responsible for the development of MIS are numerous and have been a prime concern for many Researchers and Practitioners. Both Inter and external factors must be taken into account when trying to understand and organization's criteria for deciding about technology. The following are the factors which are responsible for development of MIS :
1. External
2. Internal
External Factors : External Factors are conditions that exist in organization's external environment. The factors can be found at the industry level or in national policies.
(a) **Industry level :** At the industry level, we are looking at characteristics as degree of diffusion of certain technologies, the availability of external know-how, for example, technology suppliers, the degree of innovativeness of the industry, the requirements imposed by major customers and external markets and overall levels of competition and technology sophistication in the industry.
(b) **National Policies :** For the external factors the national policies also affect the organization that indirectly affects the subsystems of the organization.
Internal Factors : Internal factors internal of the firm that may affect the development of MIS can be grouped into three categories:
i) **Past Experience with Technology :** The organizations past experience about the technology in terms of exposure and organizational learning ultimately affects its future in developing technology.
ii) **Organizational Characteristics :** An organization's characteristic like size, influence the adoption of MIS application in organization. The adoption of certain technologies may appear more appropriate for the larger firms because of the large capital investments and the skilled human resources involve in the implementation and operation of such technologies. Smaller firms are less affected by organizational inertia and they show a greater degree of involvement of organizational member's especially top management during implementation. Ready to use software and less
expensive equipments of MIS application are more attractive to smaller firms.
iii) **Organizational Pursued strategy :** Internal factors deal with the organizations pursued strategy on both orientation and technology policy. An organization's strategy reflects its action with market and technology, which ultimately modify its experience and consequently its overall characteristics and capabilities. The need for a strong technology has been advocated by a number of authors and investments in MIS should therefore be closely aligned with overall corporate strategy.

Other Factors :
Customer Satisfaction : Development of MIS is affected by customer satisfaction.
Customer of the services should be satisfied by the presented system.
Effective : Development should be effective in terms of organizational benefit & user satisfaction.
Efficient : Development should use all the resources, organization values efficiently.

Development of MIS
The plan for development and its implementation is a basic necessity for MIS. In MIS the information is recognized as major resource like capital and time. If this resource has to be managed well, it calls upon the management to plan for it and control it, so that the information becomes a vital resource for the system. The management information system needs good planning. This system should deal with the management information not with data processing alone. It should provide support for the management planning, decision making and action. It should provide support to the changing needs of business management. A long range MIS plan provides direction for the development of the system and provides a basis for achieving the specific targets or tasks against time frame.
Following are the contents of MIS planning **:**
MIS Goals and Objectives : It is necessary to develop the goal and objectives for the MIS which will support the business goals. The MIS goals and objectives will consider management philosophy, policy constraints, Business risk, internal and external environment of the organization and business. The goals and objectives of the MIS would be so stated that they can be measured. The typical statements of the goals can be providing online information on the stock and market; the query processing should not exceed more than three seconds and the like.

Strategy for Plan Achievement : The designer has to take a number of strategic decisions for the achievement of MIS goals and objectives. They are
d) **Development Strategy :** Ex. an online, batch , a real time.
e) **System Development Strategy :** Designer selects an approach to system development like operational verses functional, accounting verses analysis.
f) **Resources for the Development :** Designer has to select resources. Resources can be in-house verses external, customized or use of package.
g) **Manpower Composition :** The staff should have the staffs of an analyst, and programmer.

The Architecture of MIS : The architecture of the MIS plan provides a system and subsystem structure and their input, output and linkage. It spells out in details the subsystem from the data entry to processing, analysis to modeling and storage to printing.
The System Development Schedule : A schedule is made for development of the system. While preparing a schedule due consideration is given to importance of the system in the overall information requirements. This development schedule is to be weighed against the time scale for achieving certain information requirements.
Hardware and Software Plan : Giving due regards to the technical and operational feasibility, the economics of investment is worked out. Then the plan of procurement is made after selecting the hardware and software. One can take the phased approach of investing starting from the lower configuration of hardware going to the higher as development take place. The process needs matching the technical decisions with the financial decisions.

What are the stages of Development of MIS?

In order to develop a system successfully, it is managed by breaking the total development process into smaller basic activities or phases. Any system development process, in general, is understood to have the following phases**:**

i) Systems Planning
ii) Systems Analysis
iii) Systems Design
iv) Systems Implementation
v) Systems Operation and Support

Different approaches to Development of MIS

There are two basic approaches for development of MIS**:**

a) **System development life cycle:** The system development life cycle have
Following steps of development**:**

i) Systems Planning
ii) Systems Analysis
iii) Systems Design
iv) Systems Implementation
v) Systems Operation and Support (System Maintenance)

b) **Prototyping:** Prototyping is the process of creating an incomplete model of the future full-featured system, which can be used to let the users have a first idea of the completed program or allow the clients to evaluate the program.

Advantages:

i) The designer and implementer can obtain feedback from the users early in the project development.
ii) The client and the contractor can compare that the developing system matches with the system specification, according to which the system is built.
iii) It also gives the engineer some idea about the accuracy of initial project estimates and whether the deadlines can be successfully met.

The process of prototyping involves the following steps:

i) Identify basic requirements.
ii) Develop initial prototype.
iii) **Review:** The customers, including end-users, examine the prototype and provide feedback for additions or changes.
iv) **Revise and Enhance the Prototype:** Using the feedback both the specifications and the prototype can be improved. If changes are introduced then a repetition of steps 3 and 4 may be needed.

Types of prototyping: System prototyping are of various kinds. However, all the methods are in some way based on two major types of prototyping**:**

Throwaway Prototyping: Throwaway or Rapid Prototyping refers to the creation of a model that will eventually be discarded rather than becoming part of the finally delivered system. After preliminary requirements gathering is accomplished, a simple working model of the system is constructed to visually show the users what their requirements may look like when they are implemented into a finished system. The most obvious reason for using Throwaway Prototyping is that it can be done quickly.

Evolutionary Prototyping: Evolutionary Prototyping (also known as **Breadboard Prototyping**) is quite different from Throwaway Prototyping. The main goal when using Evolutionary Prototyping
is to build a very good prototype in a structured manner so that we can refine it or make further changes to it. The reason for this is that the Evolutionary prototype, when built, forms the heart of the
new system, and the improvements and further requirements will be built on to it. It is not discarded or removed like the Throwaway Prototype. When developing a system using Evolutionary Prototyping, the system is continually refined and rebuilt.

· **Incremental Prototyping:** The final product is built as separate prototypes. At the end the separate prototypes are merged in an overall design.

Advantages of Prototyping:

i) **Reduced Time and Costs:** Prototyping can improve the quality of requirements and specifications provided to developers. Early determination of what the user really wants can result in faster and less expensive software.

ii) **Improved and Increased User Involvement:** Prototyping requires user involvement and allows them to see and interact with a prototype; allowing them to provide better and more complete feedback and specifications. Since users know the problem better than anyone, the final product is more likely to satisfy the users desire for look, feel and performance.

Disadvantages of Prototyping:

i) **Insufficient Analysis:** Since a model has to be created, developers will not properly analyze the complete project. This may lead to a poor prototype and a final project that will not satisfy the users.

ii) **User Confusion for Prototype and Finished System:** Users can begin to think that a prototype, intended to be thrown away, is actually a final system that merely needs to be finished or polished.

Users can also become attached to features that were included in a prototype for consideration and then removed from the specification for a final system.

iii) **Excessive Development Time of the Prototype:** A key property to prototyping is the fact that it is supposed to be done quickly. If the developers forget about this fact, they will develop a prototype that is too complex.

iv) **Expense of Implementing Prototyping:** The start up costs for building a development team focused on prototyping may be high. Many companies have to train the team for this purpose which needs extra expensive

Types of information system

For most businesses, there are a variety of requirements for information. Senior managers need information to help with their business planning. Middle management need more detailed information to help them monitor and control business activities. Employees with operational roles need information to help them carry out their duties.

As a result, businesses tend to have several "information systems" operating at the same time. This revision note highlights the main categories of information system and provides some examples to help you distinguish between them.

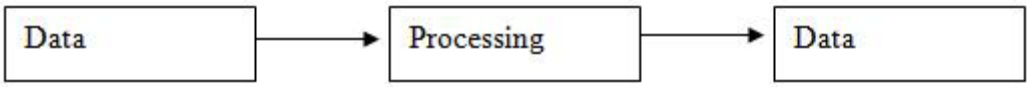
The main kinds of information systems in business are described briefly below:

Information tem	Description
Executive pport Systems	An **Executive Support System ("ESS")** is designed to help senior nagement make strategic decisions. It gathers analyses and summarizes the internal and external information used in the business. A good way to think ut an ESS is to imagine the senior management team in an aircraft cockpit - n the instrument panel showing them the status of all the key business vities. ESS typically involves lots of data analysis and modeling tools such what-if" analysis to help strategic decision-making.
Management ormation tems	A **management information system ("MIS")** is mainly concerned with rnal sources of information. MIS usually take data from the transaction cessing systems (see below) and summarize it into a series of management orts.MIS reports tend to be used by middle management and operational ervisors.
Decision-pport Systems	Decision-support systems ("DSS") are specifically designed to help nagement make decisions in situations where there is uncertainty about the sible outcomes of those decisions. DSS comprise tools and techniques to gather relevant information and analyse the options and alternatives. DSS n involves use of complex spreadsheet and databases to create "what-if" dels.
Knowledge nagement tems	Knowledge Management Systems ("KMS") exist to help businesses create share information. These are typically used in a business where employees ıte new knowledge and expertise - which can then be shared by other people he organization to create further commercial opportunities. Good examples ude firms of lawyers, accountants and management consultants. KMS are built around systems which allow efficient categorization and ribution of knowledge. For example, the knowledge itself might be contained vord processing documents, spreadsheets, PowerPoint presentations. Internet es or whatever. To share the knowledge, a KMS would use group aboration systems such as an intranet.
Transaction Processing Systems	As the name implies, Transaction Processing Systems ("TPS") are designed to process routine transactions efficiently and accurately. A business will have several (sometimes many) 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	Office Automation Systems are systems that 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 (e.g. Microsoft Office XP) or systems that allow employees to work from home or whilst on the move.

The discipline of MIS can be categorized in the following 6 classes:
i) Transaction Processing System (TPS)
ii) Management Information System (MIS)
iii) Decision Support System (DSS)
iv) Executive Support System (ESS)
v) Office Automation Systems (OASs), and
vi) Business Expert Systems (BESs)

Transaction Processing System

TPS processes transaction and produces reports. It represents the automation of the fundamental, routine processing used to support business operations. It does not provide any information to the user to his/her decision-making. TPS uses data and produces data as shown in the following diagram.



Previously, TPS was known as Management Information System. Prior to computers, data processing was performed manually or with simple machines. The domain of TPS is at the lowest level of the management hierarchy of an organization.

Management Information System (MIS)

MIS is an information system, which processes data and converts it into information. A management information system uses TPS for its data inputs. The information generated by the information system may be used for control of operations, strategic and long-range planning. Short-range planning, management control, and other managerial problem solving. It encompasses processing in support of a wide range of organizational functions & management processes. MIS is capable of providing analysis, planning & decision making support. The functional areas of a business may be marketing, production, human resource, finance and accounting.

Decision Support System (DSS)

A decision support system (DSS) is an information system application that assists decision-making. DSS tends to be used in planning, analyzing alternatives, and trial and error search for solution. The elements of the decision support system include a database, model base & software. The main application areas of DSS are Production, finance and marketing.

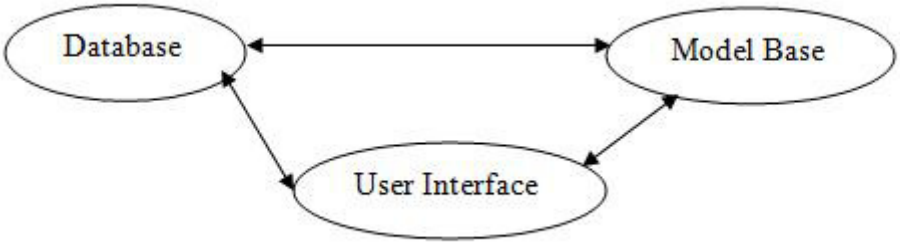


Fig: Elements of DSS

DSS can be differentiated from MIS on the basis of processing the information. MIS processes data to convert it into information. DSS processes information to support the decision making process of a manager.

Executive Support System (ESS)

Executive Support System (ESS) is an extension of the management information system, which is a special kind of DSS; An ESS is specially tailored for the use of chief executive of an organization to support his decision-making. It includes various types of decision-making but it is more specific and person oriented.

Office Automation Systems (OAS)

Office automation refers to the application of computes and communication technology to office functions. Office automation systems are meant to improve the productivity of managers at various levels of management of providing secretarial assistance and better communication facilities.

Office activities may be grouped under two classes, namely

i) Activities performed by clerical personnel (clerks, secretaries, typist, etc.,) and

ii) Activities performed by the executives (managers, engineers or other professionals like economist, researches etc.)

In the first category, the following is a list of activities.

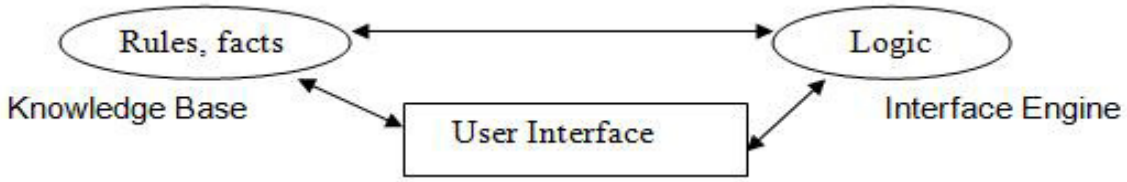
a) Typing
b) Mailing
c) Scheduling of meetings and conferences,
d) Calendar keeping, and
e) Retrieving documents

The following is a list of activities in the second category (managerial category)

a) Conferencing.
b) Production of information (messages, memos, reports, etc.) and controlling performance

Business Expert Systems: These systems are one of the main types of knowledge-based information systems. These systems are based on artificial intelligence, and are advanced information systems. A business expert system is a knowledge based information system that uses its knowledge about a specific, complex application area to act as an expert. The main components of an expert system are:

a. Knowledge Base
b. Interface Engine
c. User Interface



Designing of MIS:-

In the conceptual design, the feasibility of meeting the management objectives for the MIS is assessed and a broad picture of the system is analyzed. It involves the following steps:

1) Define problem:

The first step in conceptual design is to clearly understand and define the problem to be solved. The information needs of the organization are to be identified and understood in this step, which can be determined by understanding the mission, objectives and operating plans for the business.

2) Set system objectives:

System objectives should be stated in quantitative terms. For example, 'pay salary to 100 percent employees by the last day of the month'.

3) Identify constraints:

System constraints may be classified into two categories:

a) External constraints

These are external to the organization. For example constraints imposed by the customers, the government and the suppliers.

b) Internal constraints

These are imposed from within the organization. For example, non-cooperation and lack of support from top management, resource constraints like manpower, time and money etc.

4) Determine information needs:

For determination of information needs, users should specify:

a) What they want out of an information system and
b) Items of information that are needed to achieve the predetermined objectives.

5) Determine information sources:

Sources of information may be classified as given below:

a) Internal and external records:

The internal records may be in written form like files, inputs and outputs, correspondence, reports etc., whereas external records may include trade publications, government statistics, etc.

b) Managers and operating personnel:

User-managers and operating staff may be an important source. However, gathering data from the source involves interviewing the managers and operating personnel, which requires proper planning and skill.

6) Develop various designs:

More than one alternative conceptual designs are to be developed which are compared to select the optimum one, which:

a) Meets the requirements of the users/organizations and
b) Is cost effective

Various criteria can be adopted as a basis for evaluating the designs such as economic, performance, operational etc.

7) Documentation of the conceptual design:

The documentation involves:

a) Overall system flow
b) System inputs
c) System outputs, and
d) Other documentations like activity sheet and system description, etc.

8) Report preparation:

The report prepared should mention the problem, objectives and an overall view of the system. Justifications for selecting the alternatives and many more.

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UNIT –IV INFORMATION TECHNOLOGY

Recent Developments in the Application of Information Technology (IT) to Population Data Collection, Processing and Dissemination

1: introduction

The past decade has seen a quantum leap in Information Technology (IT) which, coupled with improved survey methodologies and procedures, will greatly enhance data quality and timeliness as well as reduce manpower needs. IT also opens up new methods of data dissemination, which facilitates analysis and wider circulation. Responding to the new opportunities available, the Department of Statistics has undertaken a thorough re-examination of its Census and population Surveys in order to exploit IT possibilities to its fullest potential. This paper will discuss Singapore's plans to apply the latest IT applications for efficient field operation and data processing in the upcoming Census 2000. It begins with a brief description of the technologies used in previous censuses, followed by possible ways to incorporate the latest IT innovations in Census 2000. IT plans in data collection; data processing and data dissemination are then discussed.

1A: Use of Technology in Previous Population Censuses and Surveys

The 1980 Census adopted the traditional method of census-taking and used mainframe computers extensively for data processing and tabulation. The 1990 Census was a bold experiment in data collection methodology. Administrative records were merged through unique identification numbers, reticulation of census districts was computerized and a pre-census household database was created to facilitate information collection from households. An integrated database system was used to capture and update data, while fieldwork was monitored through hand-held computers. In 1995, the mid-decade General Household Survey successfully adopted Computer Assisted Telephone Interviewing (CATI) as the main mode of data collection from households. 2 Census 2000 will most likely exploit IT innovations and cutting edge technologies in data collection and processing. Several interesting developments are presently happening which makes this possible. Firstly, the PC penetration rate has reached about one-third of total households, many of which have Internet access. With the government's policy of increasing IT literacy and promoting the use of the Internet in schools, PC and Internet penetration levels are likely to be much higher by 2000. Secondly, in line with Singapore's vision of transforming the Republic into "an intelligent island" by the year 2000, an island-wide multimedia broadband network will be in place by 1998. This nation-wide computer network will give Singaporeans access to a wide range of services like high-speed Internet access, teleshopping, video-conferencing, entertainment-on-demand, electronic libraries and government services from the comfort of their homes.

1B: Approach to Census 2000

The starting point of Census 2000 will be the HR (Household Registration) Database which is maintained by DOS. This database contains basic particulars of all citizens and permanent residents in Singapore. It is regularly updated with records from various administrative sources. Basic personal and some socio-demographic information on individuals will be available for Census 2000. However, data items that is not available in any

Government source (e.g. occupation and transport mode) need to be collected during census.
By further merging the HR Database with telephone numbers and foreigner's data from the respective authorities, a pre-census database will be formed. This will act as a live database whereby it is consistently updated as households respond through the various data collection modes including Internet submission, CATI, CAPI and mail or fax back methods.

2: DATA COLLECTION

Singapore can no longer afford to collect data using the traditional approach of full fieldwork enumeration. This is because of the tight labour situation we are facing. The 2000 Census will learn from and advance the 3 experiences of the 1990 Census and the 1995 mini-Census (General Household Survey) data collection methodologies. The 1990 Census adopted the pre-census database approach and collected other data through field enumeration. The 1995 mini-Census exploited IT further. Not only were records of individuals extracted from administrative databases, they were channeled to a Computer-Assisted Telephone Interviewing (CATI) system. The 1995 mini-Census is believed to be the first large-scale survey in the region to be conducted with the help of computers and telephones. The interviewing process was re-engineered to improve the survey operational efficiency and to protect the privacy of the homes of respondents. For the Census 2000, relevant data on individuals from various sources, which are merged into the HR Database, will be pre-printed onto Census forms for verification by households. Only new data items or those not available in HR Database require responses from the households. This will result in significant savings in time and effort on the part of enumerators in form filling and on the part of coders and data-entry operators.

2A: CATI

Instead of interviewing and collecting information from the field for the 1995 mini-Census, data were obtained through telephone interviews and entered directly into the computer by the interviewers. Simple editing checks were also built into the system for direct on-line correction or verification with the respondents. The need to verify particulars with the respondents at a later date was greatly minimized. The CATI system in 1995 was built from scratch, using Microsoft Visual Basic 3.0 (VB), together with Microsoft Access 1.1 as the database engine.

2B: Internet Submission

The Department of Statistics would take opportunity of the ever increasing popularity of the Internet to collect data from households which have Internet access. The households will be supplied with passwords, which will enable them to enter the Department's Census web-site, retrieve their household 6 record and input their individual and household particulars. The data will then be transmitted, via the Internet, to the Census Office to update the live database. This electronic data interchange (EDI) approach would further alleviate the administrative burden of respondents, reduce manpower required to conduct the Census, improve statistical processing time and further increase the efficiency of internal operations. The Department views this restructuring in data processing methodology as necessary, in the light of new IT developments and the technology push. What is required then is for the Department to position Internet Submission within the coherent system of computer-based tools which have already been developed to increase productivity and efficiency as well as improve data timeliness.

2C: Mail-Out/Mail-In-Or-Transmit Back Electronically

For households with unlisted telephone numbers, the mail-out/mail-back approach can be adopted. Forms with pre-printed personal particulars could be sent out to the households. Apart from households mailing the completed forms back, we are studying several options. These include the use of dedicated digitized fax machines which read in the images and convert them to codes, interactive multimedia, and of course providing a hotline for such households to be interviewed immediately through CATI.

2D : CAPI

The CAPI system could be used in the 2000 Census. The smaller group of enumerators could each be equipped with a note-book computer to enter information on the spot. The interviewing process, including routing and checking, would be guided by the program in the enumerator's computer. This system of computer-assisted personal interviewing allows for the integration of various traditional steps, such as data collection, data entry and data editing, into one interactive cycle. Hence, a clean, machine readable record directly after the completion of the interview will be produced. CAPI would also ensure streamlined questioning. The automatic branching into relevant questions would be of tremendous help to the 7 Interviewers. Furthermore, it ensures that all relevant data items are answered by the respondents. Selection of appropriate descriptive responses from a "pull-down" menu during interviewing eradicates coding errors later in the data Processing stage, as these are automatically coded at the front-end.

3 : DATA PROCESSING

Owing to the huge number of documents involved and the considerable Amount of manpower time that have to be devoted to handling them, the traditional approach of processing data has to be further improved upon. Further use of IT in data processing would help alleviate the manpower shortage problem and ensure speedy and reliable results. It is planned for data processing to be undertaken concurrently with the data collection stage, especially for data obtained through the CATI, CAPI and the Internet. These systems would automatically screen for obvious errors, omissions and glaring inconsistencies during the interviewing stage with the respondents, so that these can be corrected on the spot. This process greatly reduces the need for data entry operators during the data processing stage, as evident in the 1995 mini-Census.

3A : Imaging and Intelligent Character Recognition

Census forms returned through the "mail or transmit-back" approach during Census 2000 would be designed for direct imaging to create electronic Documents. Intelligent character recognition will then be used to convert the Responses for each data item from an image into character format, which can Then be processed by the computer. As much information as possible in the Census forms would be converted into computer files with minimum human Intervention. In addition to being machine-readable, the census forms would be Designed to be "user-friendly". OMR can be adopted to capture self-coded responses where the number Of possible answers to a question are limited or a large proportion of responses Fall into a few categories. On the other hand, OCR can capture the remaining Write-in responses e.g. occupation, place of work and industry.

3B: Automatic Coding

The 1990 Census and 1995 mini-Census made use of automatic coding in The first instance to code occupation and industry at detailed levels. This process Involves the matching of the name of firm/organization for industry coding or Occupational description for occupation coding with computer data dictionaries. The industry data dictionary contains the names of single-establishment Companies as well as multi-establishment companies with at least 20 employees And having the specific five-digit Singapore Standard Industrial Classification (SSIC) codes. Common abbreviations or synonyms of companies' names are Added to the dictionary to increase the matching rate. The occupation data dictionary is created from the Singapore Standard Occupational Classification (SSOC) and contains occupational titles and Synonyms, alternative occupational titles and other related terms. The coding System is designed to bypass superfluous words and characters that do not Elaborate or explain the job content. The SSOC data dictionary is enhanced as And when new occupational titles and descriptions or new synonyms and Abbreviations are encountered, so that the automatic coding rate can be improved for subsequent rounds of matching.

3C: Computer-Assisted Coding

In the 1990 Census and the 1995 mini-Census, occupation or industry Descriptions, which could not be automatically coded by the system, were Batched for Computer-Assisted Coding (CAC). This involved manual effort in Searching for the correct code associated with the descriptive answer. For the Coding of industry, the SSIC data dictionary, which contains three fields, Namely, activity of company, main product of company and the corresponding SSIC code, was matched with the descriptions of the "product" and the "activity/service" captured. For the coding of occupation, the coders studied the Occupation description available to them together with other pertinent Information extracted for each working person on the screen. They then referred to a computerized alphabetical index of occupational description through a "pull down" Menu and selected the appropriate response. Once selected, the system stored the 5-digit SSOC code that corresponds to the description. For the 2000 Census, these systems could well serve as prototypes to be further improved upon. The Batch-Editing sub-system to check intra- and inter record Consistencies, the Housekeeping sub-system to check for duplicate Records and the Derivation sub-system to derive information not explicitly Collected from the households would also be enhanced.

3D: Data Warehousing and Data Mining

Data warehousing concept will be used to manage and store the vast Quantity of data efficiently. Database warehousing is a major driver in IT Presently and offers a data storage architecture for collating, processing and Managing data from different sources and databases into a single repository so That analysis can be performed with a user-friendly interface. With the data warehouse, related data could be grouped into subject Matter "data marts" for easy access. Furthermore, data collected from subsequent surveys or administrative sources could be easily matched with Census records For more detailed analysis and comparison. The data warehouse also supports the use of multiple processors in processing the vast volume of data, speeding up The access of Census data significantly. A new tabulation software, FASTAB, would be used to tabulate the Massive amount of information stored in the data warehouse. The Department of Statistics, in collaboration with the Information Technology Institute, is currently Developing FASTAB, which offers a user-friendly windows interface to cross tabulate Data fields extremely quickly. In addition, FASTAB provides good Presentation of tabulated data and enables

automatic transfer of tabulations into The Microsoft Office environment for further manipulation and analysis. Data mining tools will be used during the analysis stage to automate the Process of finding key trends and results from the vast volume of data collected in the Census. With the rapid changes in IT technology, it will be prudent to keep abreast of the latest development in new tools and programs and to finalize The strategies nearer the end of data processing stage.

4: DATA DISSEMINATION

All the tabulations generated for Census 2000 will be of postscript Quality to be printed on desk-top laser printers for publication in hard copies. This traditional paper publication method will still retain its importance in providing official statistics to a wide range of users. However, advances in IT Are providing more opportunities for data dissemination. Census results can be Disseminated in other electronic media such as diskettes and CD-ROMs. This Will be of particular interest to researchers. Providing on-line access is a popular method of information Dissemination that is gaining greater acceptance. Database containing census Data can be created to provide on-line access to interested users. Subscribers of The Time Series Retrieval and Dissemination (TREND) System, which is a Windows-based on-line system developed by the Department of Statistics, are Able to obtain time-series data on economic and social topics. Internet users would also be able to access census data through the Statistics Singapore Home Page.

5: CONCLUSION

The Department of Statistics is continually exploring ways to improve Survey operations and enhance the quality and timeliness of its products and services. Wherever feasible, IT advances are incorporated to achieve the objectives. Census 2000 will showcase some of the innovative solutions. These include database merging, pre-printing of particulars on census forms and the use of Internet, CATI and CAPI. New IT tools are sought to enhance and strengthen the data collection, processing and dissemination processes, while Keeping in perspective the need to moderate cost increases and improve data Quality and timeliness.

Multimedia Approach to Information Processing

Multimedia is media and content that uses a combination of different content form. This contrasts with media that use only rudimentary computer displays such as text-only or traditional forms of printed or hand-produced material. Multimedia includes a combination of text, audio, still images, animation, videos or interactivity content forms.

Multimedia is usually recorded and played, displayed, or accessed by information content processing devices, such as computerized and electronic devices, but can also be part of a live performance. Multimedia devices are electronic media devices used to store and experience multimedia content. Multimedia is distinguished from mixed media in fine art; by including audio, for example, it has a broader scope. The term "rich media" is synonymous for interactive multimedia. Hypermedia can be considered one particular multimedia application.

Major characteristics of multimedia

Multimedia presentations may be viewed by person on stage, projected, transmitted, or played locally with a media player. A broadcast may be a live or recorded multimedia presentation. Broadcasts and recordings can be either analog or digital electronic media technology. Digital online multimedia may be downloaded or streamed. Streaming multimedia may be live or on-demand.

Multimedia games and simulations may be used in a physical environment with special effects, with multiple users in an online network, or locally with an offline computer, game system, or simulator.
The various formats of technological or digital multimedia may be intended to enhance the users' experience, for example to make it easier and faster to convey information. Or in entertainment or art, to transcend everyday experience.

A laser show is a live multimedia performance.
Enhanced levels of interactivity are made possible by combining multiple forms of media content. Online multimedia is increasingly becoming object-oriented and data-driven, enabling applications with collaborative end-user innovation and personalization on multiple forms of content over time. Examples of these range from multiple forms of content on Web sites like photo galleries with both images (pictures) and title (text) user-updated, to simulations whose co-efficient, events, illustrations, animations or videos are modifiable, allowing the multimedia "experience" to be altered without reprogramming. In addition to seeing and hearing, haptic technology enables virtual objects to be felt. Emerging technology involving illusions of taste and smell may also enhance the multimedia experience.

History of the term
The term *multimedia* was coined by singer and artist Bob Goldstein (later 'Bobb Goldsteinn') to promote the July 1966 opening of his "Light Works at L'Oursin" show at Southampton, Long Island. Goldstein was perhaps aware of a British artist named Dick Higgins, who had two years previously discussed a new approach to art-making he called "inter media."
On August 10, 1966, Richard Albarino of Variety borrowed the terminology, reporting: “Brainchild of song scribe-comic Bob (‘Washington Square’) Goldstein, the ‘Light works’ is the latest *multi-media* music-cum-visuals to debut as discothèque fare.” Two years later, in 1968, the term "multimedia" was re-appropriated to describe the work of a political consultant, David Sawyer, the husband of Iris Sawyer—one of Goldstein’s producers at L’Oursin.

Multimedia (multi-image) setup for the 1988 Ford New Car Announcement Show, August 1987, Detroit, MI

In the intervening forty years, the word has taken on different meanings. In the late 1970s, the term referred to presentations consisting of multi-projector slide shows timed to an audio track.[3][4] However, by the 1990s 'multimedia' took on its current meaning.

In the 1993 first edition of McGraw-Hill's Multimedia: Making It Work, Tay Vaughan declared "Multimedia is any combination of text, graphic art, sound, animation, and video that is delivered by computer. When you allow the user – the viewer of the project – to control what and when these elements are delivered, it is interactive multimedia. When you provide a structure of linked elements through which the user can navigate, interactive multimedia becomes hypermedia." Multimedia System

A computer system with the capabilities to capture, digitize, compress , store, decompress and present information is called multimedia system. The aim of multimedia system is to provide a creative and effective way of producing, storing and communicating information. The application areas of multimedia are marketing, training, education, entertainment, etc.

Application of multimedia:-

a) Multimedia presentation: Multimedia presentation can be used to better explain a subject matter to the students because it enhances the comprehension capability of students. It is extremely effective in getting across new ideas and concepts.

b) Entertainment: Multimedia technology is used by entertainment industry as in games, films, cartoons, animation, sound effects etc.

c) Software: Multimedia is used for training purpose or guide. So users can operate software without help of trainers.

d) Business communication: Multimedia is very powerful tool for enhancing the quality of business communication.

e) Multimedia web pages: Multimedia feature in web pages make more attractive, user friendly.

Several examples are as follows:

Creative industries

Creative industries use multimedia for a variety of purposes ranging from fine arts, to entertainment, to commercial art, to journalism, to media and software services provided for any of the industries listed below. An individual multimedia designer may cover the spectrum throughout their career. Request for their skills, range from technical, to analytical, to creative.

Commercial uses

Much of the electronic old and new media used by commercial artists is multimedia. Exciting presentations are used to grab and keep attention in advertising. Business to business, and interoffice communications are often developed by creative services firms for advanced multimedia presentations beyond simple slide shows to sell ideas or liven-up training. Commercial multimedia developers may be hired to design for governmental services and nonprofit services applications as well.

Entertainment and fine arts

In addition, multimedia is heavily used in the entertainment industry, especially to develop special effects in movies and animations. Multimedia games are a popular pastime and are software programs available either as CD-ROMs or online. Some video games also use multimedia features. Multimedia applications that allow users to actively participate instead of just sitting by as passive recipients of information are called *Interactive Multimedia*. In the Arts there are multimedia artists, whose minds are able to blend techniques using different media that in some way incorporates interaction with the viewer. One of the most relevant could be Peter Greenaway who is melding Cinema with Opera and all sorts of digital media. Another approach entails the creation of multimedia that can be displayed in a traditional fine arts arena, such as an art gallery. Although multimedia display material may be volatile, the survivability of the content is as strong as any traditional media. Digital recording material may be just as durable and infinitely reproducible with perfect copies every time.

Education

In Education, multimedia is used to produce computer-based training courses (popularly called CBTs) and reference books like encyclopedia and almanacs. A CBT lets the user go through a series of presentations, text about a particular topic, and associated illustrations in various information formats. Edutainment is the combination of education with entertainment, especially multimedia entertainment.

Learning theory in the past decade has expanded dramatically because of the introduction of multimedia. Several lines of research have evolved (e.g. Cognitive load, Multimedia learning, and the list goes on). The possibilities for learning and instruction are nearly endless.

The idea of media convergence is also becoming a major factor in education, particularly higher education. Defined as separate technologies such as voice (and telephony features), data (and productivity applications) and video that now share resources and interact with each other, synergistically creating new efficiencies, media convergence is rapidly changing the curriculum in universities all over the world. Likewise, it is changing the availability, or lack thereof, of jobs requiring this savvy technological skill.

The English education in middle school in China is well invested and assisted with various equipments. In contrast, the original objective has not been achieved at the desired effect. The government, schools, families, and students spend a lot of time working on improving scores, but hardly gain practical skills. English education today has gone into the vicious circle. Educators need to consider how to perfect the education system to improve students' practical ability of English. Therefore an efficient way should be used to make the class vivid. Multimedia teaching will bring students into a class where they can interact with the teacher and the subject. Multimedia teaching is more intuitive than old ways; teachers can simulate situations in real life. In many circumstances teachers don't have to be there, students will learn by themselves in the

class. More importantly, teachers will have more approaches to stimulating students' passion of learning

Journalism

Newspaper companies all over are also trying to embrace the new phenomenon by implementing its practices in their work. While some have been slow to come around, other major newspapers like *The New York Times*, *USA Today* and *The Washington Post* are setting the precedent for the positioning of the newspaper industry in a globalized world.

News reporting is not limited to traditional media outlets. Freelance journalists can make use of different new media to produce multimedia pieces for their news stories. It engages global audiences and tells stories with technology, which develops new communication techniques for both media producers and consumers. Common Language Project is an example of this type of multimedia journalism production.

Multimedia reporters who are mobile (usually driving around a community with cameras, audio and video recorders, and wifi-equipped laptop computers) are often referred to as Mojos, from *mo*bile *jo*urnalist.

Engineering

Software engineers may use multimedia in Computer Simulations for anything from entertainment to training such as military or industrial training. Multimedia for software interfaces are often done as collaboration between creative professionals and software engineers.

Industry

In the Industrial sector, multimedia is used as a way to help present information to shareholders, superiors and coworkers. Multimedia is also helpful for providing employee training, advertising and selling products all over the world via virtually unlimited web-based technology

Mathematical and scientific research

In mathematical and scientific research, multimedia is mainly used for modeling and simulation. For example, a scientist can look at a molecular model of a particular substance and manipulate it to arrive at a new substance. Representative research can be found in journals such as the journal of multimedia .

Medicine

In Medicine, doctors can get trained by looking at a virtual surgery or they can simulate how the human body is affected by diseases spread by viruses and bacteria and then develop techniques to prevent it.

Document imaging

Document imaging is a technique that takes hard copy of an image/document and converts it into a digital format (for example, scanners).

Disabilities

Ability Media allows those with disabilities to gain qualifications in the multimedia field so they can pursue careers that give them access to a wide array of powerful communication forms.

Miscellaneous

In Europe, the reference organization for Multimedia industry is the European Multimedia Associations Convention (EMMAC).

Structuring information in a multimedia form

Multimedia represents the convergence of text, pictures, video and sound into a single form. The power of multimedia and the Internet lies in the way in which information is linked.

Multimedia and the Internet require a completely new approach to writing. The style of writing that is appropriate for the 'on-line world' is highly optimized and designed to be able to be quickly scanned by readers.[8]

A good site must be made with a specific purpose in mind and a site with good interactivity and new technology can also be useful for attracting visitors. The site must be attractive and innovative in its design, function in terms of its purpose, easy to navigate, frequently updated and fast to download.[9]

When users view a page, they can only view one page at a time. As a result, multimedia users must create a 'mental model of information structure'

Decision of appropriate information Technology for proper MIS.

Information is a *critical resource* in the operation and management of organizations. Timely availability of relevant information is vital for effective performance of managerial functions such as planning, organizing, leading, and control. An information system in an organization is like the nervous system in the human body: it is the link that connects all the organization's components together and provides for better operation and survival in a competitive environment. Indeed, today's organizations run on information.

The term *information system* usually refers to a computer-based system, one that is designed to support the operations, management, and decision functions of an organization. Information systems in organizations thus provide information support for decision makers. Information systems encompass transaction processing systems, management information systems, decision support systems, and strategic information systems.

Information consists of data that have been processed and are meaningful to a user. A system is a set of components that operate together to achieve a common purpose. Thus a management information system collects, transmits, processes, and stores data on an organization's resources, programs, and accomplishments. The system makes possible the conversion of these data into management information for use by decision makers within the organization. A management information system, therefore, produces information that supports the management functions of an organization (Davis & Olson, 1985; Lucas, 1990; McLeod, 1995).

Value of Information

Information has a great impact on decision making, and hence its *value is* closely tied to the decisions that result from its use. Information does not have an absolute universal value. Its value is related to those who use it, when it is used, and in what situation it is used. In this sense, information is similar to other commodities. For example, the value of a glass of water is different for someone who has lost his way in Arctic glaciers than it is to a wanderer in the Sahara Desert.

Economists distinguish value from *cost* or *price* of a commodity incurred to produce or procure the commodity. Obviously, the value of a product must be higher than its cost or price for it to be *cost-effective.*

The concept of *normative value* of information has been developed by economists and statisticians and is derived from decision theory. The basic premise of the theory is that we always have some preliminary knowledge about the occurrence of events that are relevant to our decisions. Additional information might modify our view of the occurrence probabilities and consequently change our decision and the expected payoff from the decision. The value of

additional information is, hence, the difference in expected payoff obtained by reduced uncertainty about the future event.

Information supports decisions, decisions trigger actions, and actions affect the achievements or performance of the organization. If we can measure the differences in performance, we can trace the impact of information, provided that the measurements are carefully performed, the relationships among variables are well defined, and possible effects of irrelevant factors are isolated. The measured difference in performance due to informational factors is called the *realistic value* or *revealed value* of information.

For most information systems, particularly those supporting middle and top management, the resulting decisions often relate to events that are not strictly defined and involve probabilities that cannot be quantified. The decision-making process often is obscure and the outcomes are scaled by multiple and incomparable dimensions. In such cases, we may either attempt to perform a multi attribute analysis or derive an overall *subjective value.* The *subjective value* reflects people's comprehensive impression of information and the amount they are willing to pay for specific information (Ahituv, Neumann, & Riley, 1994).

Information as an Aid to Decision Making

Simon (1977) describes the process of decision making as comprising four steps: intelligence, design, choice, and review. The *intelligence* stage encompasses collection, classification, processing, and presentation of data relating to the organization and its environment. This is necessary to identify situations calling for decision. During the *decision* stage, the decision maker outlines alternative solutions, each of which involves a set of actions to be taken. The data gathered during the intelligence stage are now used by statistical and other models to forecast possible outcomes for each alternative. Each alternative can also be examined for technological, behavioral, and economic feasibility. In the *choice* stage, the decision maker must select one of the alternatives that will best contribute to the goals of the organization. Past choices can be subjected to *review* during implementation and monitoring to enable the manager to learn from mistakes. Information plays an important role in all four stages of the decision process. Figure 1 indicates the information requirement at each stage, along with the functions performed at each stage and the feedback loops between stages.

Classification of Management Information Systems

There are various types of management information systems. Mason and Swanson (1981) describe four categories of management information systems: (1) databank information system, (2) predictive information system, (3) decision-making information system, and (4) decision-taking information system. The classification is based on the level of support that the information system provides in the process of decision making. Sachdeva (1990) comprehensively presents these four types of systems:

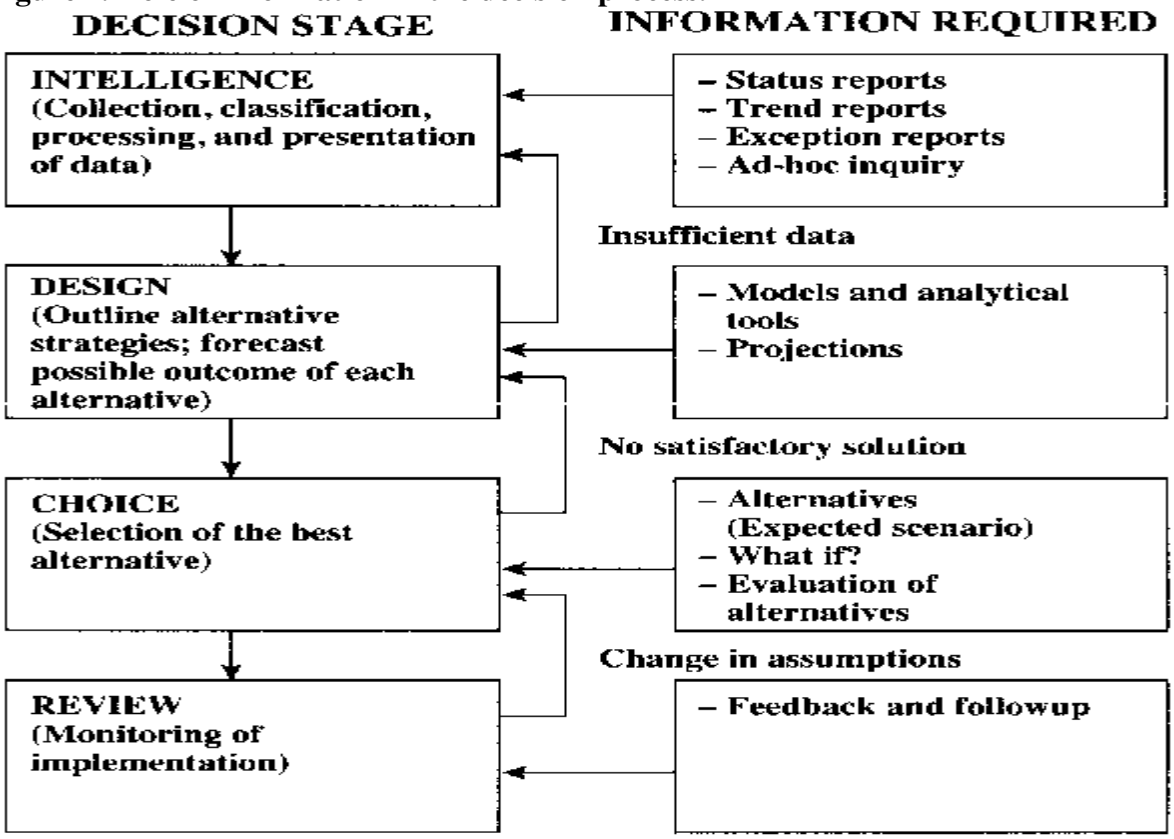
Databank Information System: - The responsibility of this information system is to observe, classify, and store any item of data which might be potentially useful to the decision maker. Examples of the kind of data that might be recorded in such a database for a given village, region, or area are as follows:

·Number of farms
· Number of units of arable land (hectares, fedans, acres)
· Average farm size
· Amounts of selected farm inputs applied annually
· Production per year on a unit of land for selected crops

A second example of data that might be recorded in a database (this time involving data internal to the organization) is as follows:

· Number of extension staff by category and assigned to a particular village, region, or area
· Number of work hours devoted by staff to selected concerns for a particular village, region, or area
· Total extension salary costs and other expenses by village, region, or area
· Number of demonstrations conducted for selected farm technologies by village, region, or area
· Number of on-farm trials conducted for selected farm technologies by region or area
· Number of radio, TV, and print media releases regarding selected farm technologies by time period and region or area

Figure 1. Role of information in the decision process.



Each of these databases can be summarized and converted to single tabular presentations of information of interest to management. When information from two or more time periods is compared, trends can be observed.

Predictive Information System: - This system moves beyond pure data collection and the determination of trends over time. Predictive information systems provide for the drawing of inferences and predictions that are relevant to decision making. If data from the above examples were to be used in this way, it is possible to obtain information useful for making predictions or for drawing inferences. For example, tables containing the following information for a given village, region, or area might be produced:

· The ratio between the number of farms and the various categories of extension staff members
· The ratio between the amount of farmland and the various categories of extension staff members

· Amount of extension financial operating resources allocated per year to selected farmer problems or concerns

· Amount of extension financial resources, both salary and operating expenses, allocated per year to selected extension approaches to solving different farmer problems or concerns

Information obtained from these kinds of analyses is normally summarized in a two-way tabular format. And likewise, the information often is compared over time. Managers can then use such information to make predictions, for example to forecast costs of particular undertakings for budgeting purposes or as a basis for predicting results if a given change is made, such as change in the number of demonstrations with a given change in staffing.

Decision-Making Information System. This system goes one step further in the process of decision making and incorporates the value system of the organization or its criteria for choosing among alternatives. An extension organization's values are many and varied. They include concerns for resolving farmer problems, increasing and providing for stability of farmer incomes, and improving the quality of farm life. But they also including and providing for stability of farmer incomes, and improving the quality of farm life. But they also include an intent to provide well for staff members (training, adequate salaries, etc.) and to aid in the process of bringing about rural economic development.

Table 1. Information Groups in India's Agricultural Extension System.

Levels	Groups	Types of Information Needed
Central	Extension commissioner, joint commissioners, directors, joint directors, etc. of the directorate of extension, ministry of agriculture	(1) Information on human resources, plans, and budgets for various extension services (2) Statewide monitoring and evaluation of activities completed
State	Director of agriculture, additional director, joint directors, etc. of the state department of agriculture	(1) District wide information on extension programs, activities, expenditures, etc (2) Research-extension linkages and coordination with other allied departments such as animal husbandry and horticulture
District	District agricultural officers (DAOs)	(1) Information on extension resources and constraints at subdivision and block levels (2) Training requirements of staff at subdivision and block levels
Subdivision	Sub divisional agricultural officers	(1) Field demonstration programs, activities planned and implemented by subject-matter specialists (SMSs) (zone) at the block level (2) Technical program and constraints identified at the block level
Block (county)	Agricultural extension officers	(1) Performance of VEWs in terms of achievements in extension activities (2) Field-level problem of assessment of beneficiaries' response to various extension programs

Information regarding these various attributes helps managers to make more enlightened decisions. Examples of ways that an extension organization uses information from a decision-making information system are as follows:

· Change in specific farm outputs (yields, practices) following selected extension activities

· Change in staff productivity following selected interventions (in-service training, better transport, etc)

· Comparison of relative costs and relative effectiveness of alternative extension delivery methods

· Analysis of economic returns to farmers who adopt recommended practices as compared to those who do not

Decision-Taking Information System:- Examples of decision-taking information systems are not usually found in an extension organization. This is a decision system in which the information system and the decision maker are one and the same. Management is so confident in the assumptions incorporated in the system that it basically relegates its power to initiate action to the system itself. Airplanes carry automatic pilot systems, which are an example of a decision-taking system. Once activated, the system itself keeps the plane on course and at the proper speed and altitude (according to parameters determined by the pilot). Another example of decision-taking information systems is found in modem factory production. In automobile production, continuous inventories of parts are maintained by computer as cars move down an assembly line. Orders are placed automatically by the computer when additional parts are needed. This is done without the intervention of a manager.

The choice of an appropriate management information system (MIS) category primarily depends on the nature of the decisions it supports. While unstructured decisions may use MIS-category (I), the highly structured ones, such as production schedules in an industry, may use MIS-category (iv). Further, Banerjee and Sachdeva (1995) observe that "as the deep structure of the decision problem becomes more and more understood, we may move to higher level of MIS i.e., from MIS-category (I) to MIS-category (ii); and MIS-category (ii) to MIS-category (iii); and so on."

Need for automation

An automated MIS system contains data just as a manual system does. It receives input, processes input, and delivers the processed input as output. Some input devices allow direct human-machine communication, while others require data to be recorded on an input medium such as a magnetizable material (specially coated plastic flexible or *floppy* disks and magnetic tapes). The keyboard of a workstation connected directly to a computer is an example of a direct input device. Use of automation makes it possible to store immense quantities of information, to avoid many of the errors that find their way into manual records, and to make calculations and comparisons that would be practically impossible in a manual system.

Organization of a database

Data are usually generated at the field level through transaction-processing systems, but once the data are captured, any echelon along the organizational hierarchy may use them, provided that information requirements have been well defined, appropriate programs have been implemented, and a means has been arranged for the sharing of the data. This would imply that the same data can be used by different sets of programs; hence we distinguish between the database (a set of data) and the applications (a set of programs). In a decision support system (DSS), this set of programs is the *model base* (Keen & Morton, 1978).

The term *database* may refer to any collection of data that might serve an organizational unit. A database on a given subject is a collection of data on that subject that observes three criteria:

comprehensiveness (completeness), no redundancy, and appropriate structure. Comprehensiveness means that all the data about the subject are actually present in the database.

No redundancy means that each individual piece of data exists only once in the database. Appropriate structure means that the data are stored in such a way as to minimize the cost of expected processing and storage (Awad & Gotterer, 1992).

The idea of a large corporate database that can be flexibly shared by several applications or model bases has been realized by means of software packages specially devised to perform such tasks. These packages, called *database management systems* (DBMSs), are available in the market under different trade names such as ORACLE, SYBASE, INGRES, FOXBASE, and dBASE.

Networking and interactive processing

The two principal blocks that facilitate development and use of MIS are DBMS and *telecommunications.* The former makes data integration possible, while the latter brings information closer to the end users, who constitute nodes in a telecommunication network. The notion of telecommunications implies that some geographical distance exists between the computer site and the users' locations and that data are electronically transmitted between them. Remote applications may be executed between two floors in the same building, two offices in the same city, two offices on the same continent, or two places on opposite sides of the globe (Martin, 1990).

System alternatives and evaluation: Centralization versus decentralization

A completely centralized information system handles all processing at a single computer site, maintains a single central database, has centralized development of applications, provides central technical services, sets development priorities centrally, and allocates computer resources centrally. The system's remote users are served by transporting input and output data physically or electronically.

A completely decentralized system may have no central control of system development, no communication links among autonomous computing units, and stand-alone processors and databases at various sites. Each unit funds its own information-processing activities and is totally responsible for all development and operation.

An advantage of centralized information systems is that they provide for standardization in the collection of data and the release of information. There also are some *economies of scale. A* centralized system reduces the need for multiple hardware, software, space, personnel, and databases. It may be possible to recruit more qualified personnel in a central facility.

Observations indicate that user motivation and satisfaction are increased under a decentralized environment. This is attained because users feel more involved and more responsible, systems are better customized to their specific needs, and they usually get better response time in routine operations as well as in requests for changes.

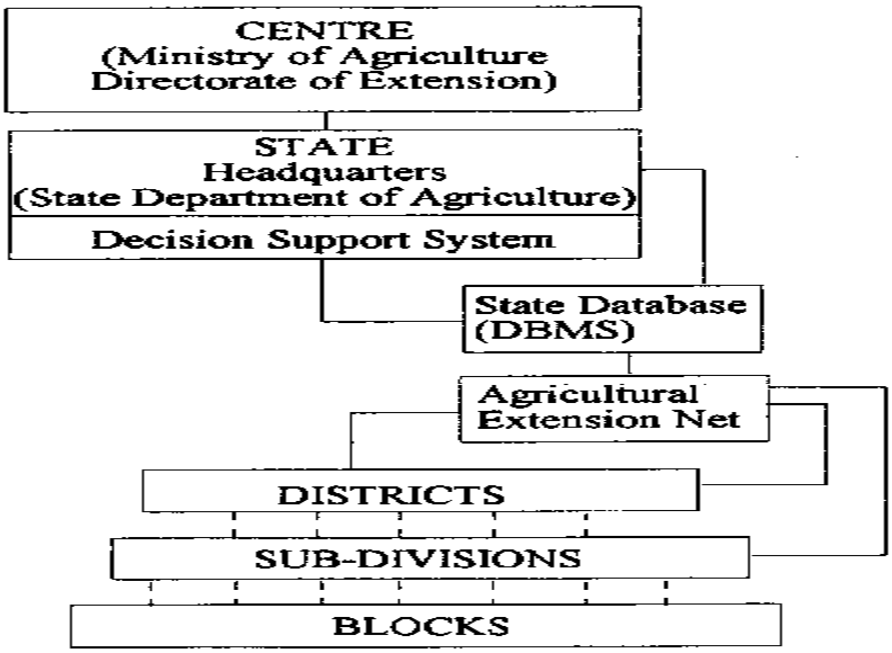
It is likely that for national agricultural extension systems, neither a completely centralized nor a completely decentralized system is desirable. While it may be useful to decentralize hardware and software resources at different locations, the development of applications and provision of technical services may better be centralized.

End-user computing

The widespread use of personal computers and computer-based workstations has brought with it the age of end-user computing. End-user computing is a generic term for any information-processing activity performed by direct end users who actually use terminals or microcomputers to access data and programs. The manager as end user may be provided with powerful software (like DBMS) for accessing data, developing models, and performing information processing directly. This has brought computing directly under the control of the end users and eliminates

their dependence on the information systems specialist and the rigidities of predesigned procedures. They may now make ad hoc queries of information and analyze it in various ways. They may write programs, or may often use ready-made programs stored in the computer, using the computing power of a local PC or the mainframe to which it is connected.

Figure2. A typical MIS for a national extension system.



Illustrative computer-based MIS

A national agricultural extension system is a nationwide system managed by the national government. In India, agriculture is a state subject under the division of powers between the national and the state levels. Nevertheless, the national government supplements the financial resources of the states and provides coordination at the national level. The state's administrative machinery is divided into districts, districts into subdivisions, subdivisions into blocks. A block is a group of villages and the basic unit for the administration of an agricultural extension program. Data collected at the block level need to be integrated at higher administrative levels to provide an integrated view at the district and state levels to support planning, monitoring, and decision making.

Keeping in view the requirements of the extension system and the budget constraints of the states, a typical design of the computer-based MIS is shown in Figure 2.

However, the actual design may vary with the size of the state and other considerations. An integrated database for the entire state may be supported by a mainframe/minicomputer at the state headquarters. Suitable programs for the analysis of data may be designed to provide an interactive decision support system at the state level. Each district and subdivision may be provided with a mini/micro computer, depending on the volume of data to be handled. The computers in the districts and subdivisions may be networked with the state computer. The local data may be stored and processed in the district/subdivision, and the shared data with appropriate level of aggregation may be transmitted to the state headquarters to update the integrated database. The districts and subdivisions would have direct access to the integrated database with proper authorizations assigned to them through their passwords. The blocks may have only the

input-output terminals connected to the subdivision computer to feed data to the subdivision and make on-line inquiries as and when necessary.

Choice of Appropriate IT Systems – Database, Data warehousing & Datamining Concepts

Database : An organization must have accurate and reliable data for effective decision making. For this, the organization maintains records of various facts of its operation by building appropriate models of the diverse classes of objects of interest. The models capture the essential properties of the objects and records relationship among them. Such related data is called "Database"

Objectives :
i) The users of the database establish their view of the data and its structure without regards to the actual physical storage of the data.
ii) That the database establishes a uniform high level of accuracy and consistency. Validation rules are applied by the DBMS.
iii) The data should be available for use by application and by queries.
iv) The data item prepared by one application are available to all applications or queries. No data items are owned by an application.
v) The data base can be evolved according to application usage and query needs.

Elements of DBMS: The elements of database management system are **:**
i) **Database:** Databases are banks and is an important constituent of any information system. Data bank for computerized information is organized in the form of a collection of file stored on secondary storage media. A file is a collection of records for each entity in the system. The record being a collection of data items representing the attributes of an entity.
ii) **People:** The people involved with the database system can be divided into 2 groups: those who use the information system provided by the system and those who design develop and manage the system itself.
iii) **Database Planning and Design Technique:** Since the database system involves people from all parts of organization with variety of information needs the development and operation of database system must be very carefully planned and managed. The data must be carefully designed to provide efficient excess to information required by different users.
iv) **Computer Hardware and Software:** Computer hardware and software for DBMS are two different important elements of DBMS. They are technological foundation of DBMS.

Database design
Database design is the process of designing the overall schema of database. This process is mainly divided in four phases: analysis phase, design phase refinement phase and physical design phase.
Analysis Phases: This is the initial phase of database design which includes the specification of data stored; operation applied on the stored data and description of application which use the data stored. This phase also takes care of existing system, its requirements and operation performed, so that expectation from the new system can be understood.

Design Phase: It is not real analysis of enterprise. The output of the design phase is directly converted into real database. This is divided into two parts **:**

a) **Conceptual Design:** The information gathered in first phase is converted into data model which is used to specify data stored, data relationship and constraints applied on stored data.
b) **Logical Design:** Information represented in data model is converted into database schema of chosen DBMS or the conceptual schema mentioned above is applied for implementation from database schema.
Refinement Phase: This phase is used to correct problems which are encountered while analyzing the relations of database schema. This phase is used to
i) Analyze the relations.
ii) Identify the anomalies.
iii) Refine database schema to correct or remove anomalies.
Physical design: This phase is used to create physical schema corresponding to the logical schema. It is used to specify internal storage structure and file organization that is required to store the data.

Database Management System
A data model is not just a way of structuring data: it also defines a set of operations that can be performed on the data. A data model is a mechanism that provides abstraction for the database application. Database modeling is used for representing entities of interest and their relationship in database. It allows the conceptualization of the association between various entities and their attributes.
Following are the different models of DBMS**:**
Hierarchical Model
Network Model
Relational Model

Most database systems are built around one particular data model, although it is increasingly common for products to offer support for more than one model.

Hierarchical Model: In a hierarchical model, data is organized into a tree-like structure, implying a single upward link in each record to describe the nesting, and a sort field to keep the records in a particular order in each same-level list. Hierarchical structures were widely used in the early mainframe database management systems, such as the Information Management System (IMS) by IBM. This structure allows 1 : N relationship between two types of data. This Structure is very efficient to describe many relationships in the real world; recipes, table of contents, ordering of paragraphs, any nested and sorted information. However, the hierarchical structure is inefficient for certain database operations when a full path is not included for each record. One limitation of the hierarchical model is its inability to efficiently represent redundancy in data.

Hierarchical structure of product (HDBMS)
Network Model: The network model organizes data using two fundamental constructs, called records and sets. Records contain fields; Sets define one-to-many relationships between records: one owner, many members. A record may be an owner in any number of sets, and a member in any number of sets. The network model is a variation on the hierarchical model, to the extent that it is built on the concept of multiple branches emanating from one or more nodes. The model differs from the hierarchical model as in network model branches can be connected to multiple

nodes. The network model is able to represent redundancy in data more efficiently than in the hierarchical model. Although it is not an essential feature of the model, network databases generally implement the set relationships by means of pointers that directly address the location of a record on disk. This gives excellent retrieval performance, at the expense of operations such as database loading and reorganization.

Relational Model: Three key terms are used extensively in relational database models : **relations, attributes, and domains.** A **relation** is a table with columns and rows. The named columns of the relation are called attributes, and the domain is the set of values the attributes are allowed to take. The basic data structure of the relational model is the table, where information about a particular entity is represented in columns and rows, also called tuples. Thus, the "relation" in "relational database" refers to the various tables in the database; a relation is a set of tuples. The columns enumerate the various attributes of the entity and a row is an actual instance of the entity that is represented by the relation. As a result, each tuple of the employee table represents various attributes of a single employee. All relations in a relational database have to adhere to some basic rules to qualify as relations. First, the ordering of columns is immaterial in a table. Second, there can't be identical tuples or rows in a table. And third, each tuple will contain a single value for each of its attributes.

Product database in RDBMS

The flexibility of relational databases allows programmers to write queries that were not anticipated by the database designers. As a result, relational databases can be used by multiple applications in ways the original designers did not foresee, which is especially important for databases that might be used for a long time. This has made the idea and implementation of relational databases very popular with business organization.

There are three levels of DBMS architecture**:**

a) Internal : Also known as storage level. This level is closest to physical storage. That it is the one concerned with the way data is stored inside the concept system. Internal level is defined in terms of machine oriented constructs such as bits and bytes.

b) Conceptual: Conceptual level is defined in terms of user oriented constructs such as records. This is also called community logical level. It is a level of direction between the other 2 levels.

c) External Level: Also called user logical level. External level is the one closest to the users, that is , it is the one concerned with the way the data is seen by individual user.

Data Warehouse

A data warehouse is a relational database that is designed for query and analysis rather than for transaction processing. It usually contains historical data derived from transaction data, but can include data from other sources. Data warehouses separate analysis workload from transaction workload and enable an organization to consolidate data from several sources. This helps in:

- Maintaining historical records
- Analyzing the data to gain a better understanding of the business and to improve the business.

In addition to a relational database, a data warehouse environment can include an extraction, transportation, transformation, and loading (ETL) solution, statistical analysis, reporting, data mining capabilities, client analysis tools, and other applications that manage the process of gathering data, transforming it into useful, actionable information, and delivering it to business users.

A common way of introducing data warehousing is to refer to the characteristics of a data warehouse as set forth by William Inmon:

- Subject Oriented
- Integrated
- Nonvolatile
- Time Variant

Subject Oriented

Data warehouses are designed to help you analyze data. For example, to learn more about your company's sales data, you can build a data warehouse that concentrates on sales. Using this data warehouse, you can answer questions such as "Who was our best customer for this item last year?" or "Who is likely to be our best customer next year?" This ability to define a data warehouse by subject matter, sales in this case, makes the data warehouse subject oriented.

Integrated

Integration is closely related to subject orientation. Data warehouses must put data from disparate sources into a consistent format. They must resolve such problems as naming conflicts and inconsistencies among units of measure. When they achieve this, they are said to be integrated.

Nonvolatile

Nonvolatile means that, once entered into the data warehouse, data should not change. This is logical because the purpose of a data warehouse is to enable you to analyze what has occurred.

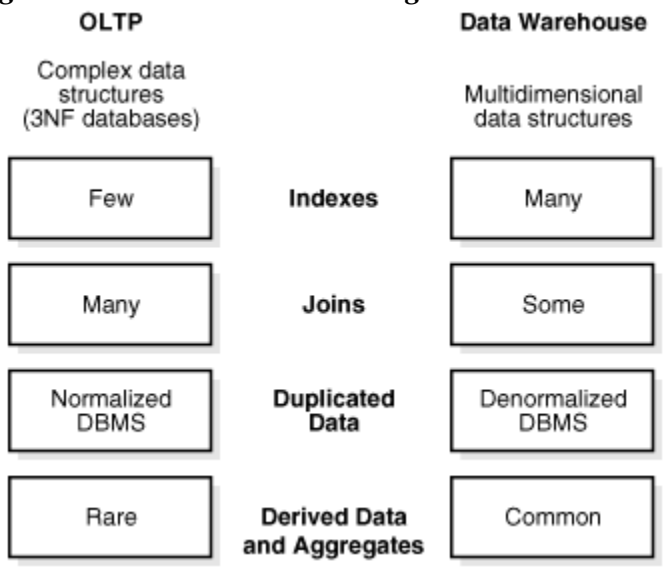
Time Variant

A data warehouse's focus on change over time is what is meant by the term time variant. In order to discover trends and identify hidden patterns and relationships in business, analysts need large amounts of data. This is very much in contrast to online transaction processing (OLTP) systems, where performance requirements demand that historical data be moved to an archive.

Contrasting OLTP and Data Warehousing Environments

Figure 1-1 illustrates key differences between an OLTP system and a data warehouse.

Figure 1-1 Contrasting OLTP and Data Warehousing Environments



Description of "Figure 1-1 Contrasting OLTP and Data Warehousing Environments"

One major difference between the types of system is that data warehouses are not usually in third normal form (3NF)**,** a type of data normalization common in OLTP environments.
Data warehouses and OLTP systems have very different requirements. Here are some examples of differences between typical data warehouses and OLTP systems:

- Workload
  Data warehouses are designed to accommodate *ad hoc* queries and data analysis. You might not know the workload of your data warehouse in advance, so a data warehouse should be optimized to perform well for a wide variety of possible query and analytical operations.
  OLTP systems support only predefined operations. Your applications might be specifically tuned or designed to support only these operations.
- Data modifications
  A data warehouse is updated on a regular basis by the ETL process (run nightly or weekly) using bulk data modification techniques. The end users of a data warehouse do not directly update the data warehouse except when using analytical tools, such as data mining, to make predictions with associated probabilities, assign customers to market segments, and develop customer profiles.
  In OLTP systems, end users routinely issue individual data modification statements to the database. The OLTP database is always up to date, and reflects the current state of each business transaction.
- Schema design
  Data warehouses often use denormalized or partially denormalized schemas (such as a star schema) to optimize query and analytical performance.
  OLTP systems often use fully normalized schemas to optimize update/insert/delete performance, and to guarantee data consistency.
- Typical operations
  A typical data warehouse query scans thousands or millions of rows. For example, "Find the total sales for all customers last month."
  A typical OLTP operation accesses only a handful of records. For example, "Retrieve the current order for this customer."
- Historical data
  Data warehouses usually store many months or years of data. This is to support historical analysis and reporting.
  OLTP systems usually store data from only a few weeks or months. The OLTP system stores only historical data as needed to successfully meet the requirements of the current transaction.

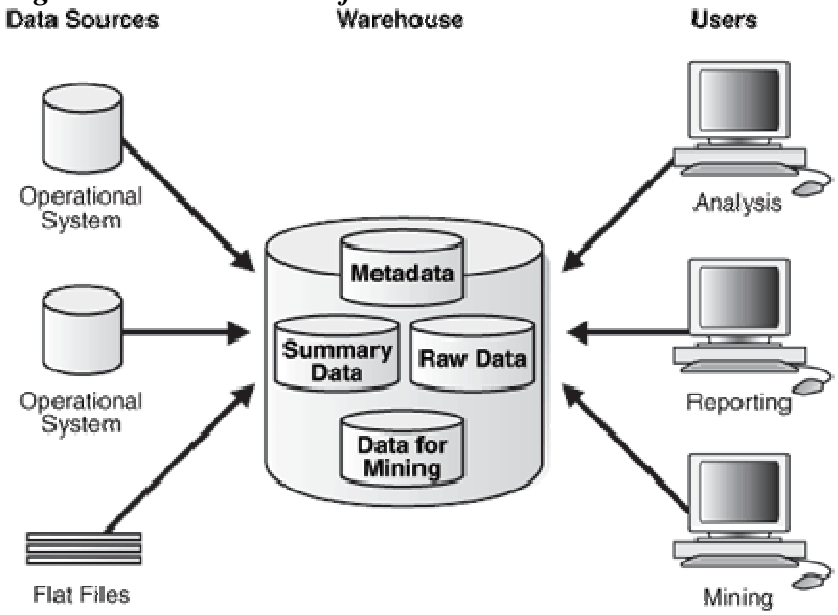
Data Warehouse Architectures
Data warehouses and their architectures vary depending upon the specifics of an organization's situation. Three common architectures are:

- Data Warehouse Architecture: Basic
- Data Warehouse Architecture: with a Staging Area
- Data Warehouse Architecture: with a Staging Area and Data Marts

Data Warehouse Architecture: Basic

Figure 1-2 shows a simple architecture for a data warehouse. End users directly access data derived from several source systems through the data warehouse.

Figure 1-2 Architecture of a Data Warehouse



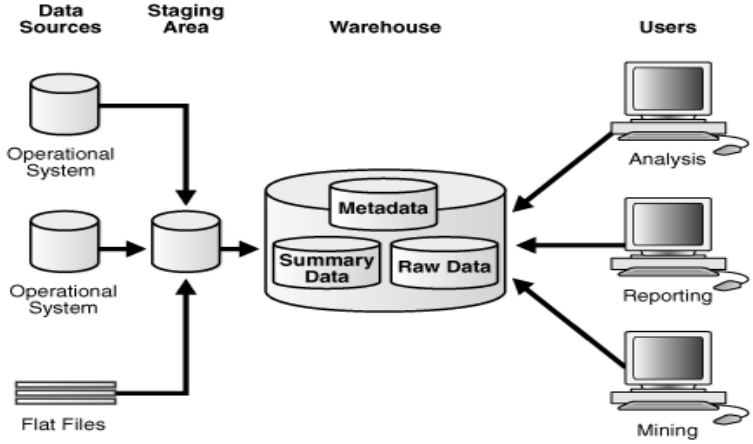
Description of "Figure 1-2 Architecture of a Data Warehouse"

In Figure 1-2, the metadata and raw data of a traditional OLTP system is present, as is an additional type of data, summary data. Summaries are very valuable in data warehouses because they pre-compute long operations in advance. For example, a typical data warehouse query is to retrieve something such as August sales. A summary in an Oracle database is called a materialized view**.**

Data Warehouse Architecture: with a Staging Area

You need to clean and process your operational data before putting it into the warehouse, as shown in Figure 1-2. You can do this programmatically, although most data warehouses use a staging area instead. A staging area simplifies building summaries and general warehouse management. Figure 1-3 illustrates this typical architecture.

Figure 1-3 Architecture of a Data Warehouse with a Staging Area

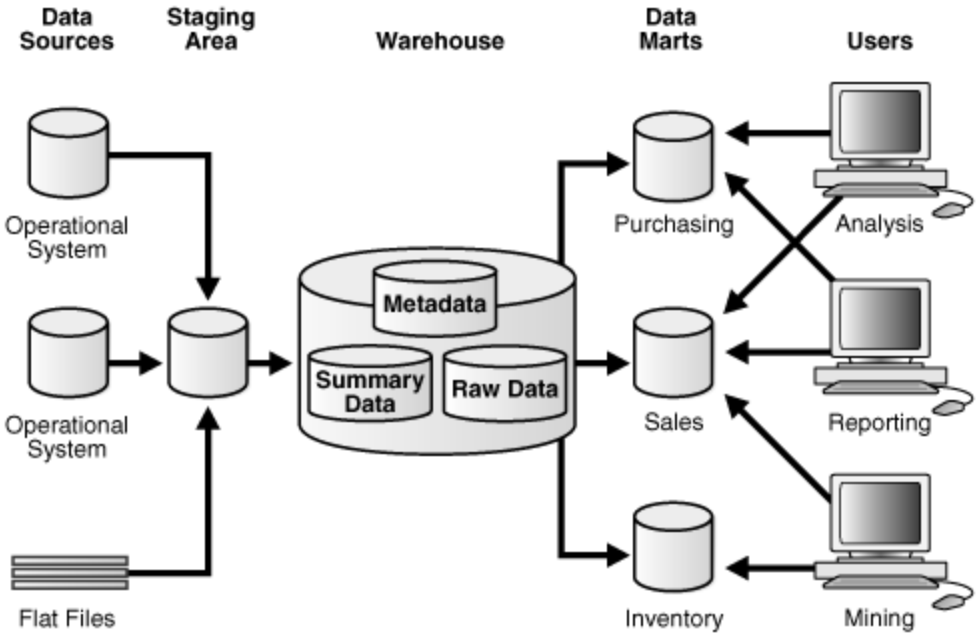


Description of "Figure 1-3 Architecture of a Data Warehouse with a Staging Area"

Data Warehouse Architecture: with a Staging Area and Data Marts

Although the architecture in Figure 1-3 is quite common, you may want to customize your warehouse's architecture for different groups within your organization. You can do this by adding **data marts**, which are systems designed for a particular line of business. Figure 1-4 illustrates an example where purchasing, sales, and inventories are separated. In this example, a financial analyst might want to analyze historical data for purchases and sales or mine historical data to make predictions about customer behavior.

Figure 1-4 Architecture of a Data Warehouse with a Staging Area and Data Marts



Description of "Figure 1-4 Architecture of a Data Warehouse with a Staging Area and Data Marts"

Note:

Data marts are an important part of many data warehouses, but they are not the focus of this book.

Extracting Information from a Data Warehouse

You can extract information from the masses of data stored in a data warehouse by analyzing the data. The Oracle Database provides several ways to analyze data:

- A wide array of statistical functions, including descriptive statistics, hypothesis testing, correlations analysis, test for distribution fit, cross tabs with Chi-square statistics, and analysis of variance (ANOVA); these functions are described in the *Oracle Database SQL Language Reference*.
- OLAP
- Data Mining

Data Mining

Data mining uses large quantities of data to create models. These models can provide insights that are revealing, significant, and valuable. For example, data mining can be used to:

- Predict those customers likely to change service providers.
- Discover the factors involved with a disease.
- Identify fraudulent behavior.

Data mining is not restricted to solving business problems. For example, data mining can be used in the life sciences to discover gene and protein targets and to identify leads for new drugs.
Oracle Data Mining performs data mining in the Oracle Database. Oracle Data Mining does not require data movement between the database and an external mining server, thereby eliminating redundancy, improving efficient data storage and processing, ensuring that up-to-date data is used, and maintaining data security.

Data mining (the analysis step of the "Knowledge Discovery in Databases" process, or KDD), an interdisciplinary subfield of computer science, is the computational process of discovering patterns in large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics, and database systems. The overall goal of the data mining process is to extract information from a data set and transform it into an understandable structure for further use. Aside from the raw analysis step, it involves database and data management aspects, data pre-processing, model and inference considerations, interestingness metrics, complexity considerations, post-processing of discovered structures, visualization, and online updating.
The term is a buzzword, and is frequently misused to mean any form of large-scale data or information processing (collection, extraction, warehousing, analysis, and statistics) but is also generalized to any kind of computer decision support system, including artificial intelligence, machine learning, and business intelligence. In the proper use of the word, the key term is *discovery*], commonly defined as "detecting something new". Even the popular book "Data mining: Practical machine learning tools and techniques with Java" (which covers mostly machine learning material) was originally to be named just "Practical machine learning", and the term "data mining" was only added for marketing reasons.[Often the more general terms "(large scale) data analysis", or "analytics" – or when referring to actual methods, artificial intelligence and machine learning – are more appropriate.
The actual data mining task is the automatic or semi-automatic analysis of large quantities of data to extract previously unknown interesting patterns such as groups of data records (cluster analysis), unusual records (anomaly detection) and dependencies (association rule mining). This usually involves using database techniques such as spatial indices. These patterns can then be seen as a kind of summary of the input data, and may be used in further analysis or, for example, in machine learning and predictive analytics. For example, the data mining step might identify multiple groups in the data, which can then be used to obtain more accurate prediction results by a decision support system. Neither the data collection, data preparation, nor result interpretation and reporting are part of the data mining step, but do belong to the overall KDD process as additional steps.
The related terms *data dredging*, *data fishing*, and *data snooping* refer to the use of data mining methods to sample parts of a larger population data set that are (or may be) too small for reliable statistical inferences to be made about the validity of any patterns discovered. These methods can, however, be used in creating new hypotheses to test against the larger data populations.
Data mining uses information from past data to analyze the outcome of a particular problem or situation that may arise. Data mining works to analyze data stored in data warehouses that are used to store that data that is being analyzed. That particular data may come from all parts of business, from the production to the management. Managers also use data mining to decide upon marketing strategies for their product. They can use data to compare and contrast among competitors. Data mining interprets its data into real time analysis that can be used to increase sales, promote new product, or delete product that is not value-added to the company.

Centralized and Distributed Processing.

Centralized Data Processing (CDP) uses Centralized computers, processing, data, control, support. The advantages are Economy for equipment and personnel, Lack of duplication, Ease in enforcing standards, security. In Distributed Data Processing (DDP)Computers are dispersed throughout organization. Which allows greater flexibility in structure, More redundancy and More autonomy.

Centralized data processing is a Computer data processing architecture where data processing support is provided by one or a cluster of computers, generally a large. dedicated computers, located in a central data processing facility. In a centralized architecture, each person is provided with a local terminal that is connected by a communications facility to the central data processing facility.

A fully centralized data processing has following features:

1. Centralized computers
2. Centralized processing
3. Centralized Data
4. Centralized Control
5. Centralized Staff Support

A Distributed data processing facility is one in which computers, usually smaller computers, are dispersed throughout the organization. The objective of such disperse is to process information in a way that is most effective based on operational.

Therefore, DDP (Distributed Data Processing) features:

1. A collection of terminals link together by some kind of communication link and has no main central computer or not fully (minimal) depend on central computer.
2. Processing of information is happening on each terminal and send results to a main server for store and retrieval purposes.
3. Data may duplicate as data may store in locally or in remote server.
4. Local computer operator can control the machine in his premises.
5. Separate staff will maintain central computer (if there any) where other terminals may control by one or few other members.

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