MANAGEMENT INFORMATION SYSTEMS

COURSE MATERIAL

Mr. Vinoth S
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VISION & MISSION STATEMENTS OF THE INSTITUTE

VISION;

- To emerge as the most preferred Business School with Global recognition by producing most competent ethical managers, entrepreneurs and researchers through quality education.

MISSION;

- **Knowledge through quality teaching learning process**; To enable the students to meet the challenges of the fast challenging global business environment through quality teaching learning process.
- **Managerial Competencies with Industry institute interface**; To impart conceptual and practical skills for meeting managerial competencies required in competitive environment with the help of effective industry institute interface.
- **Continuous Improvement with the state of art infrastructure facilities**; To aid the students in achieving their full potential by enhancing their learning experience with the state of art infrastructure and facilities.
- **Values and Ethics;** To inculcate value based education through professional ethics, human values and societal responsibilities.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO 1; Placement; To equip the students with requisite knowledge skills and right attitude necessary to get placed as efficient managers in corporate companies.

PEO 2; Entrepreneur; To create effective entrepreneurs by enhancing their critical thinking, problem solving and decision-making skill.

PEO 3; Research and Development; To make sustained efforts for holistic development of the students by encouraging them towards research and development.

PEO4; Contribution to Society; To produce proficient professionals with strong integrity to contribute to society.

Program Outcome;

PO1; Problem Solving Skill; Apply knowledge of management theories and practices to solve business problems.

PO2; Decision Making Skill; Foster analytical and critical thinking abilities for data-based decision making.

PO3; Ethical Value; Ability to develop value based leadership ability.

PO4; Communication Skill; Ability to understand, analyze and communicate global, economic, legal and ethical aspects of business.

PO5; Individual and Leadership Skill; Ability to lead themselves and others in the achievement of organizational goals, contributing effectively to a team environment.

PO6; Employability Skill; Foster and enhance employability skills through subject knowledge.

PO7; Entrepreneurial Skill; Equipped with skills and competencies to become an entrepreneur.

PO8; Contribution to community; Succeed in career endeavors and contribute significantly to the community.

Subject Code	Subject Name	L	T	P	S	C
PMF3S	MANAGEMENT INFORMATION SYSTEMS	4	0	0	1	4

Course Objectives	
C1	To enable students to understand the fundamentals of information system and its role of information in managerial decision making
C2	To throw light on fundamentals of information systems like TPS, DSS, and EIS.
C3	To manage system applications and data to best support functional areas of business
C4	To provide insights in securely managing database and information using the process of
C5	To elucidate the need and importance of ERP, its selection and implementation in workplace.

SYLLABUS

Unit. No.	Details	Hours
Unit I	Introduction to information system-The management, structure and activities-Information needs and sources-Types of management decisions and information need. System classification Elements of system, input, output, process and feedback.	12
Unit II	Transaction Processing information system, Information system for managers, Intelligence information system – Decision support system-Executive information systems.	12
Unit III	Functional Management Information System: Production Information system, Marketing Information Systems, Accounting Information system, Financial Information system, Human resource Information system.	12
Unit IV	System Analysis and Design: The work of a system analyst-SDLC-System design –Requirement analysis-Data flow diagram, relationship diagram, design-Implementation-Evaluation and maintenance of MIS, Database System: Overview of Database-Components-advantages and disadvantages of database	12

Unit V	Enterprise Resource Planning (ERP) System, Benefits of the ERP, ERP how different from conventional packages , Need for ERP , ERP components , Selection of ERP Package, ERP implementation, Customer Relationship management. Organisation & Types, Decision Making, Data & information, Characteristics & Classification of information, Cost & value of information, various channels of information and MIS	12
	Total Hours	60

Reference Books	
1.	Azam, M., Management Information System, McGrawHill Education, 2012.
2.	Laudon, K., Laudon, J. and Dass, R., Management Information Systems – Managing the Digital Firm, 11th Edition, Pearson, 2010.
3.	Murdick, R.G., Ross, J.E. and Claggett, J.R., Information Systems for Modern Management, 3rd Edition, PHI, 2011.
4.	O'Brien, J.A., Morakas, G.M. and Behl, R., Management Information Systems, 9th Edition, Tata McGraw-Hill Education, 2009.
5.	Saunders, C.S. and Pearson, K.E., Managing and Using Information Systems, 3rd Edition, Wiley India Pvt. Ltd., 2009.
6.	Stair, R. and Reynolds, G., Information Systems, 10th Edition, Cengage Learning,2012.

E-Sources	
1.	http://ebooks.lpude.in/management/mba/term_4/DMGT505_management_information_system.pdf
2.	https://www.sigc.edu/department/mba/studymet/ManagmentInformationSystem.pdf
3.	http://164.100.133.129:81/econtent/Uploads/Management_Information_System.pdf
4.	http://www.himpub.com/documents/Chapter963.pdf
5.	http://dlc.ui.edu.ng/oer.dlc.ui.edu.ng/app/upload/CIS%20302_1507198171.pdf

Assessment Tools Used			
1.	Assignments	6.	Group Discussion
2.	Internal Assessment Tests	7.	Simulation
3.	Model Exam	8.	Videos
4.	Seminars	9.	Synetics
5.	Case studies	10.	Quiz

Content Beyond Syllabus	
1.	Telecommunication network - LAN & WAN - Intranet & Extranet - Strategic uses of IT
2.	Challenges of Information Security - Data warehouse - Data mining
3.	Artificial Intelligence - Fuzzy Logic - Genetic Algorithm - Virtual Reality - E-Commerce
Additional Reference Books	
1.	Post, Gerald V., Management Information Systems: Solving Business Problems with Information Technology, Third edition, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2003.
2.	D P Goya, Management Information Systems – Managerial perspectives, Fourth edition, Vikas publishing house, 2014
3.	Scott, George M., Principles of Management Information Systems, McGraw-Hill Book Company, Singapore, 2003.
4.	Shrivastava - Fundamental of Computer& Information Systems (Wiley Dreamtech)
5.	Leon - Fundamentals of Information Technology, (Vikas)

Course Outcomes		
CO No.	On completion of this course successfully, the students will;	**Program Outcomes (PO)**
C302.1	Learn the importance of data and information in managerial decision making.	PO2, PO4
C302.2	Possess on the various IS and the its relevance to Organisational environment	PO4, PO6,
C302.3	Understand the application of IS on the various functions like Accounting, Finance , Marketing, Operations and HR	PO6,
C302.4	Identify opportunities in implementing a new database system with the help of SDLC process.	PO6
C302.5	Be exposed on the importance of selecting the appropriate ERP and its implementation.	PO6, PO7

PMF3S - MANAGEMENT INFORMATION SYSTEMS

UNIT I

INFORMATION AND THE MIS CONCEPT

- Information is a set of classified and interpreted data used in decision making. It has also been defined as 'some tangible or intangible entity which serves to reduce uncertainty about future state or events
- A management information system (MIS) is 'an integrated user-machine system for providing information to support operations, management and decision making functions in an organization. The system utilizes computers, manual procedures, models for analysis, planning, control and decision making, and a database'
- MIS facilitates managerial functioning. Management information is an important input at every level in the organization for decision making, planning, organizing, implementing, and monitoring and controlling.
- MIS is valuable because of its content, form and timing of presentation. In the context of different levels of decision making, information can be described as:
    - Source,
    - Data,
    - Inferences and predictions drawn from data,
    - Value and choices (evaluation of inferences with regard to the objectives and then choosing a course of action), and
    - Action which involves course of action.

The MIS concept comprises three interrelated and interdependent key elements:

1. management,
2. system and
3. information

MANAGEMENT AND THE MIS PROCESS

An MIS is directed towards the managerial functions of planning, controlling and monitoring, and decision making.

Planning

Planning consists of five sequential and interactive steps These are:

1. Selecting objectives
2. Identification of the activities which are required to achieve the stipulated objectives;
3. Detailing the resources - including the various skills - required to undertake the activities;
4. Determining the duration of each activity to be performed; and
5. Defining the sequence of the activities.

Monitoring and controlling

Controlling 'compels events to conform to plans' \ It involves:

- establishing standards of performance in order to reach the objective;
- measuring actual performance against the set standards; and
- keeping actions on course by correcting deviations as they appear (mid-course corrections).

The requirements for successful development of a control system are:

- defining expectations in terms of information attributes; and
- developing the logic for reporting deviations to all levels of management prior to the actual occurrence of the deviation.

Decision making

Decision making is the process of selecting the most desirable or optimum alternative to solve a problem or achieve an objective. The quality and soundness of managerial decisions is largely contingent upon the information available to the decision-maker.

- ***Strategic* decisions** are future-oriented because of uncertainty. They are part of the planning activity.
- ***Tactical* decision** making combines planning activities with controlling. It is for short-term activities and associated allocation of resources to them to achieve the objectives.
- ***Technical* decision** making is a process of ensuring efficient and effective implementation of specific tasks.

Elements of decision making

The four components of the decision making process are

· *Model* A model is an abstract description of the decision problem. The model may be quantitative or qualitative.

· *Criteria* The criteria must state how goals or objectives of the decision problem can be achieved. When there is a conflict between different criteria, a choice has to be made through compromise.

· *Constraints.* Constraints are limiting factors which define outer limits and have to be respected while making a decision. For example, limited availability of funds is a constraint with which most decision makers have to live.

· *Optimization* Once the decision problem is fully described in a model, criteria for decision making stipulated and constraints identified, the decision-maker can select the best possible solution.

TYPES OF MANAGEMENT DECISIONS

1. Programmed and non-programmed decisions:

Programmed decisions are concerned with the problems of repetitive nature or routine type matters.

A standard procedure is followed for tackling such problems. These decisions are taken generally by lower level managers. Decisions of this type may pertain to e.g. purchase of raw material, granting leave to an employee and supply of goods and implements to the employees, etc. Non-programmed decisions relate to difficult situations for which there is no easy solution.

2. Routine and strategic decisions:

- Routine decisions are related to the general functioning of the organisation. They do not require much evaluation and analysis and can be taken quickly. Ample powers are delegated to lower ranks to take these decisions within the broad policy structure of the organisation.
- Strategic decisions are important which affect objectives, organisational goals and other important policy matters. These decisions usually involve huge investments or funds. These are non-repetitive in nature and are taken after careful analysis and evaluation of many alternatives. These decisions are taken at the higher level of management.

3. Tactical (Policy) and operational decisions:

- Decisions pertaining to various policy matters of the organisation are policy decisions. These are taken by the top management and have long term impact on the functioning of the concern. For example, decisions regarding location of plant, volume of production and channels of distribution (Tactical) policies, etc. are policy decisions.

- Operating decisions relate to day-to-day functioning or operations of business. Middle and lower level managers take these decisions.
- An example may be taken to distinguish these decisions. Decisions concerning payment of bonus to employees are a policy decision. On the other hand if bonus is to be given to the employees, calculation of bonus in respect of each employee is an operating decision.

4. Organisational and personal decisions:

- When an individual takes decision as an executive in the official capacity, it is known as organisational decision.
- If decision is taken by the executive in the personal capacity (thereby affecting his personal life), it is known as personal decision.
- Sometimes these decisions may affect functioning of the organisation also. For example, if an executive leaves the organisation, it may affect the organisation. The authority of taking organizational decisions may be delegated, whereas personal decisions cannot be delegated.

5. Major and minor decisions:

- Decision pertaining to purchase of new factory premises is a major decision. Major decisions are taken by top management.
- Purchase of office stationery is a minor decision which can be taken by office superintendent.

6. Individual and group decisions:

- When the decision is taken by a single individual, it is known as individual decision. Usually routine type decisions are taken by individuals within the broad policy framework of the organisation.

- Group decisions are taken by group of individuals constituted in the form of a standing committee. Generally very important and pertinent matters for the organisation are referred to this committee. The main aim in taking group decisions is the involvement of maximum number of individuals in the process of decision- making.

SYSTEMS APPROACH

Modern management is based upon a systems approach to the organization. The systems approach views an organization as a set of interrelated sub-systems in which variables are mutually dependent. A system can be perceived as having:

- some components, functions and the processes performed by these various components;
- relationships among the components that uniquely bind them together into a conceptual assembly which is called a system; and
- an organizing principle that gives it a purpose

The organizing system has five basic parts, which are interdependent They are:

- the individual;
- the formal and informal organization;
- patterns of behaviour arising out of role demands of the organization;
- the role perception of the individuals; and
- the physical environment in which individuals work.

The interrelationship of the sub-systems within an organization is fundamental to the systems approach. The different components of the organization have to operate in a coordinated manner to attain common organizational goals. This results in synergic effects. The term *synergy* means that when different sub-systems work together they tend to be more efficient than if they work in. Thus, the output of a system with well integrated sub-systems

would be much more than the sum of the outputs of the independent sub-systems working in isolation.

The systems approach provides a total view of the organization. It enables analysis of an organization in a scientific manner, so that operating management systems can be developed and an appropriate MIS designed.

By providing the required information, an MIS can help interrelate, coordinate and integrate different sub-systems within an organization, thus facilitating and increasing coordinated working of the sub-systems, with consequent synergism. The interaction between different components of the organization depends upon integration, communication and decision making. Together they create a linking process in the organization.

Integration ensures that different sub-systems work towards the common goal. Coordination and integration are useful controlling mechanisms which ensure smooth functioning in the organization, particularly as organizations become large and increasingly complex. As organizations face environmental complexity, diversity and change, they need more and more internal differentiation, and specialization becomes complex and diverse. The need for integration also increases as structural dimensions increase.

Communication integrates different sub-systems (specialized units) at different levels in an organization. It is thus a basic element of the organizational structure necessary for achieving the organization's goals.

ORGANIZATIONAL STRUCTURE AND MIS

MIS has been described as a pyramidal structure, with four levels of information resources. The levels of information would depend upon the organizational structure. The top level supports strategic planning and policy making at the highest level of management. The second level of information resources aid tactical planning and decision making for

management control. The third level supports day-to-day operations and control. The bottom level consists of information for transaction processing. It then follows that since decision making is specific to hierarchical levels in an organization, the information requirements at each level vary accordingly.

Organizational structural implications for information systems

Concept	Implications for Information Systems
Hierarchy of authority	A tall hierarchy with narrow span of control requires more formal control information at upper levels than a flat hierarchy with wide span of control.
Specialization	Information system applications have to fit the specialization of the organization.
Formalization	Information systems are a major method for increasing formalization.
Centralization	Information systems can be designed to suit any level of centralization.
Modification of basic model	Information systems can be designed to support product or service organizations, project organizations, lateral relations and matrix organizations.
Information model of organization	Organizational mechanisms reduce the need for information processing and communication. Vertical information systems are an alternative to lateral relations. Information systems are used to coordinate lateral activities.
Organizational culture	Organizational culture affects information requirements and system acceptance.

Organizational power	Organizational power affects organizational behaviour during information system planning, resource allocation and implementation. Computer systems can be an instrument of organizational power through access to information.
Organizational growth	The information system may need to change at different stages of growth.
Goal displacement	When identifying goals during requirements determination, care should be taken to avoid displaced goals.
Organizational learning	Suggests need for information system design for efficiency measures to promote single loop learning and effectiveness measures for double loop learning.
Project model of organizational change	Describes general concepts for managing change with information system projects.
Case for stable system	Establish control over frequency of information system changes.
Systems that promote organizational change	Reporting critical change variables, organizational change, or relationships, and use of multiple channels in a semi-confusing system may be useful for promoting responses to a changing environment.
Organizations as socio-technical systems	Provides approach to requirements determination and job design when both social and technical considerations are involved.

INFORMATION

Information is processed data and takes the meaning as a tangible or intangible entity that reduces uncertainty and triggers action.

Data → Processing → Information

Characteristics of Information

1. **Timeliness:** Timeliness means that information must reach the recipients within the prescribed time-frame. (Timely information)
2. **Accuracy :** Accuracy is another key-attribute of management information(Accurately)
3. **Relevance:** Relevant information.
4. **Adequacy:** Adequacy means information must be sufficient in quality.
5. **Completeness:** Complete and should meet all his needs.
6. **Explicitness:** Good quality – does not require further analysis & vice versa.
7. **Exception-Based:** Top-managers need only exception report regarding performance of the organization.

Information Need

1) To reduce uncertainty
2) As a means of communication
3) To improve accuracy
4) To complete the task effectively
5) To simplify complications

The factors that determine the information need are

1) The Environment
2) The Size of the Organisation
3) The functional Area
4) The Managerial Level

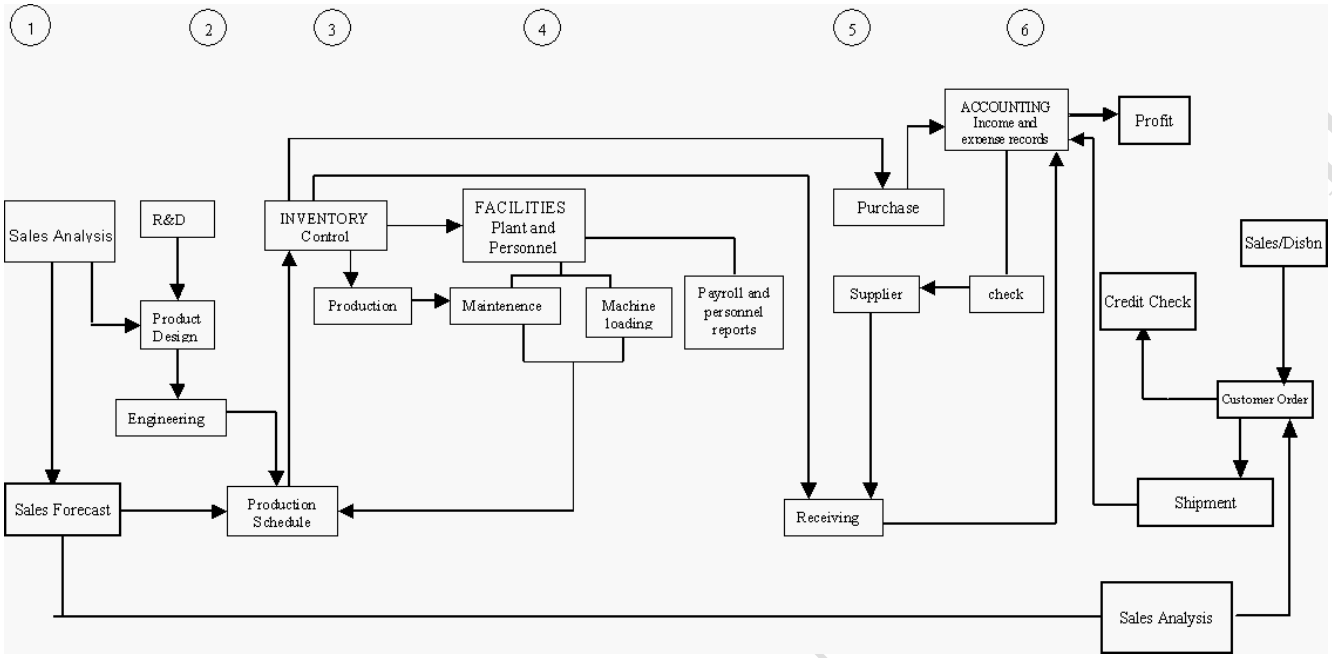
Sources of Information

1) Forms and Documents in the organisation
2) User system
3) Procedure manuals
4) Primary data collection methods like market survey, census, opinion polls, etc.,
5) Government publications and other Industry publications
6) Research studies
7) Various reports available in the organisation
8) Ledgers, Payrolls, Sales reports
9) Internets
10) Journals, Magazines, Newspapers.

Information Flow

Information flow along the various functions in an organisation

- Purchase
- Production
- Accounting
- Personnel
- Marketing
- Management and Administration



Dimensions of Information

- **Business Dimensions of Information**
  1) Availability
  2) Flexibility
  3) Timeliness
  4) Programmability
  5) Completeness
  6) Suitability
- **Technical Dimensions of Information**
  1) Validity
  2) Capacity
  3) Response Time
  4) Security
  5) Interrelations of Data

STRATEGIES FOR DETERMINING INFORMATION REQUIREMENTS

1. Identify elements in the development process
· Utilizing systems
· Information system or application
· Users
· Analysis

2. Identify characteristics of the four elements (in 1, above) in the development process which could affect uncertainty in the information requirements.

3. Identify the process uncertainties
· Existence and availability of a set of usable requirements.
· Ability of users to specify requirements.
· Ability of the analyst to elicit and evaluate information requirements.
Assess how the characteristics of the four elements in the development process (listed under 1, above) will affect the these process uncertainties.

4. Determine how the overall requirements uncertainties would be affected by the combined effects of the process uncertainties.

5. Considering the overall requirements uncertainty, choose a primary strategy for information requirements.
If uncertainty is low, then the strategy should be to:
· Ask the users what their requirements are. This presupposes that the users are able to structure their requirements and express them objectively. Asking can be done through
- questions, which may be closed or open,
- brainstorming sessions, totally open or guided, and
- group consensus as aimed at in Delphi methods and group norming.
· Wherever there are close similarities in the organization and easy replication is possible, information requirements can be derived from the existing system.
· Characteristics of the utilizing system should be analysed and synthesized. This is particularly useful if the utilizing system is undergoing change.
If uncertainty is high, discover from experimentation by instituting an information system and learning through that the additional information requirements. This is 'prototyping' or 'heuristic development' of an information system.

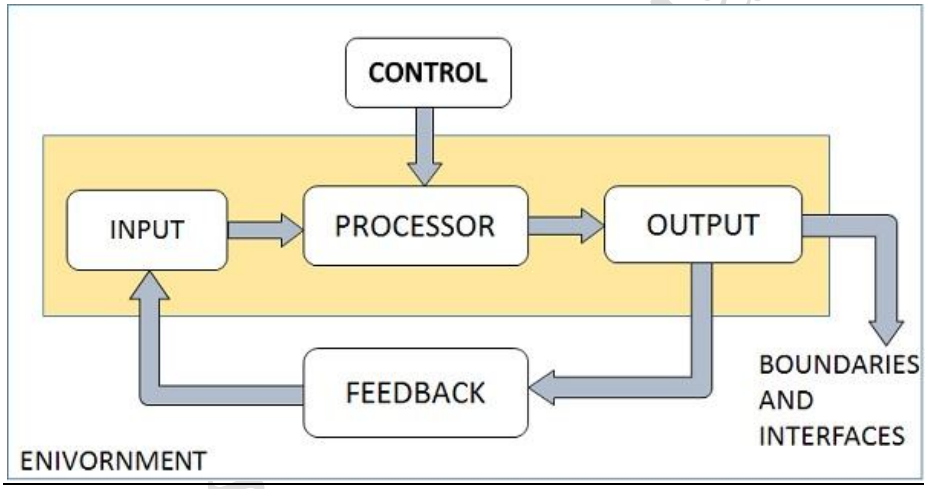
6. Select an appropriate method.

SYSTEM

A system is a set of components (subsystems or elementary parts) that operate together to achieve a common objective (or multiple objective).

- input-process-output an orderly arrangement of interdependent ideas or constructs (Abstract System)
- A set of elements which operate together to accomplish an objective (Physical System)

ELEMENTS OF A SYSTEM



- Input: Input is what data the system receives to produce a certain output.
- Output: What goes out from the system after being processed is known as Output.
- Processing: The process involved to transform input into output is known as Processing.
- Control: In order to get the desired results it is essential to monitor and control the input, Processing and the output of the system. This job is done by the control.
- Feedback: The Output is checked with the desired standards of the output set and the necessary steps are taken for achieving the output as per the standards, this process is called as Feedback. It helps to achieve a much better control in the system.

- Boundaries: The boundaries are nothing but the limit of the system. Setting up boundaries helps for better concentration of the actives carried in the system.

- Environment: The things outside the boundary of the system are known as environment. Change in the environment affects the working of the system.

- Interfaces: The interconnections and the interactions between the sub-systems is known as the Interfaces. They may be inputs and outputs of the systems.

FIGURE 10.1
The "black-box" view of a system.

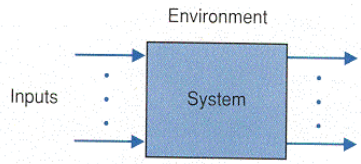
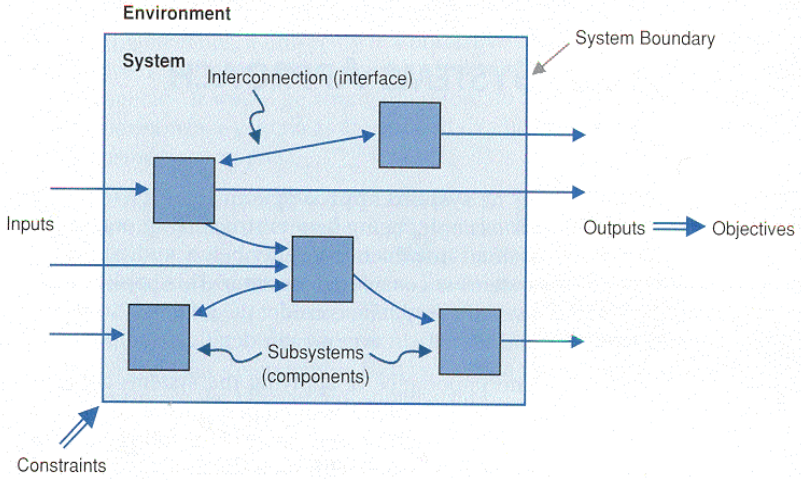
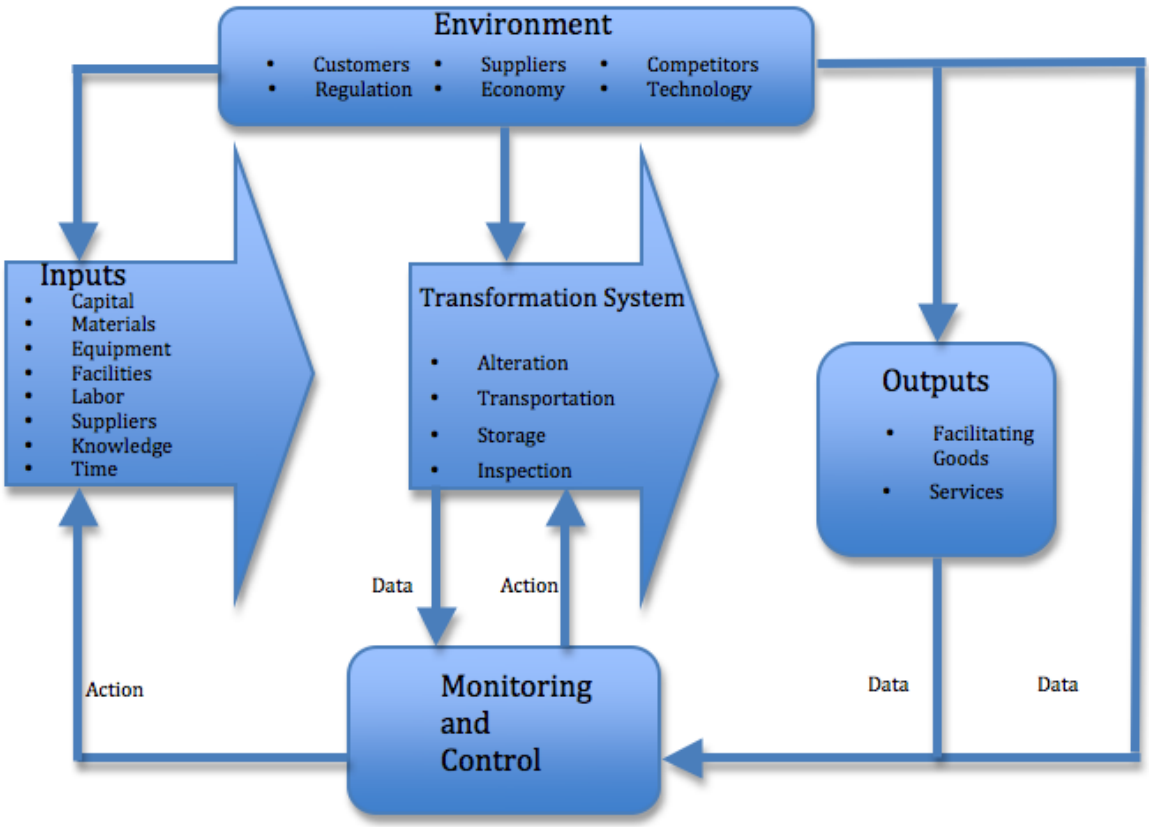


FIGURE 10.2
A system and its descriptors.



A typical system



SYSTEM CLASSIFICATION

Deterministic versus probabilistic

1. **Deterministic:** The interaction between the parts or subsystems is known for certain example: a computer program which performs exactly to a set of instructions

2. **Probabilistic:** A system that can be described in terms of probable behavior (a certain degree of error); examples: An inventory system, a five year old (who does not follow a certain set of instructions).

Closed and open systems:

3. **Closed system**: self contained, one that does not exchange material, information, or energy with its environment.

Example: A chemical reaction in a sealed, insulated container.

Relatively closed systems: in organizations and in information processing, there are systems that are relatively isolated from the environment, but are not completely closed,

these will be considered closed systems. Example: a computer program with well defined inputs, a process and an output (No agents)

4. **Open Systems**: exchange information, material, or energy with the environment, including random and undefined inputs.
   - Open systems tend to have form and structure
   - Adapt to changes in environment so as to continue to exist

Examples: Biological Systems, and Organizational Systems

Organization as a system:

The focus is on interdependency of the subsystem components of the system.

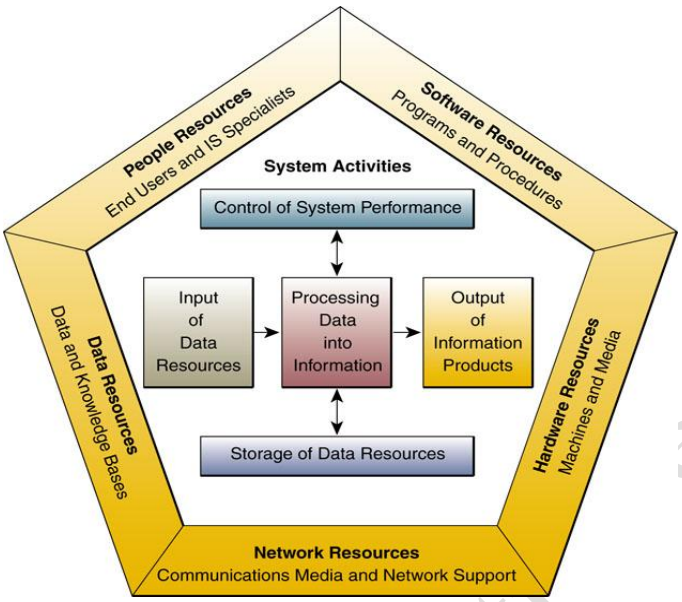
1. Subsystems: production, managerial, adaption/innovation subsystem
2. Each subsystems has goals and contributes or may be not to the whole system
3. Thus encouraging the interdependency of the subsystems.
4. The interdependency depends on communication.

UNIT II

INFORMATION SYSTEM

An information system is a set of organized procedures that, when executed, provides information to perform decision making in an enterprise

Components of an Information System



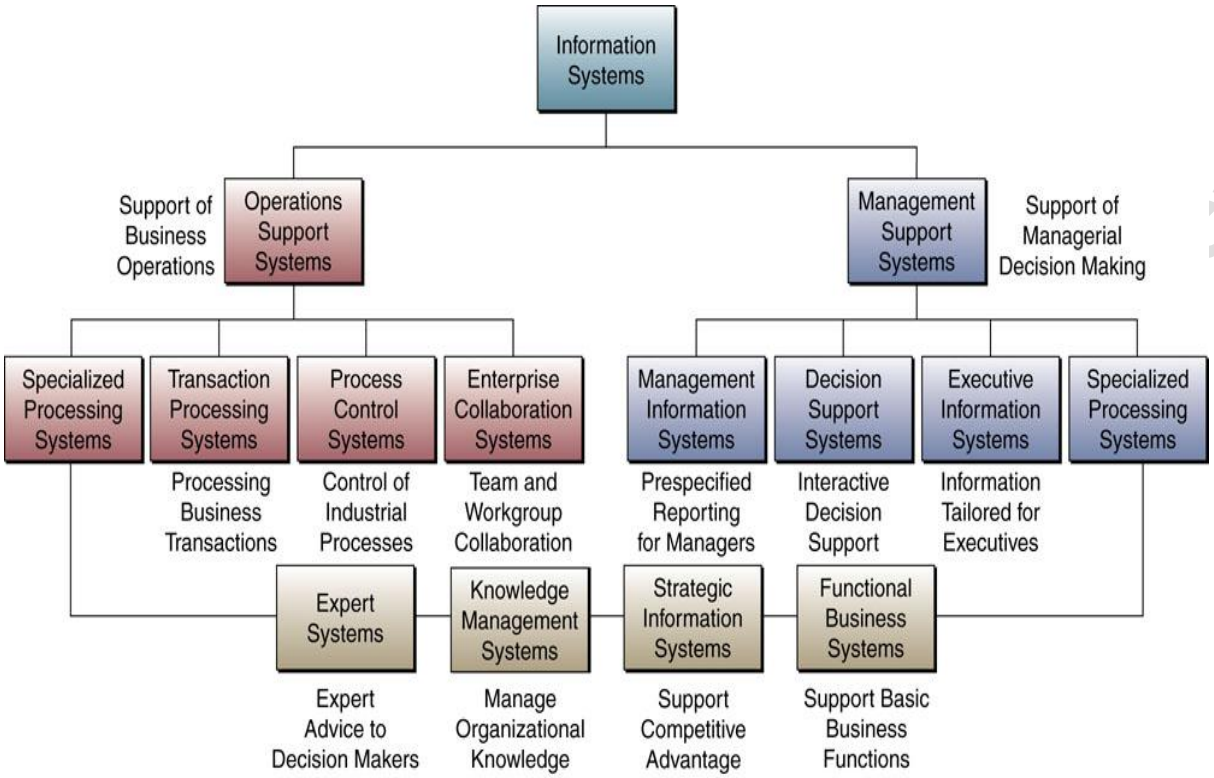
- People Resources
  - End Users
  - IS Specialists
- Hardware Resources
  - Computer systems
  - Peripherals
- Software Resources
  - System software
  - Application software
  - Procedures
- Data Resources
  - Data versus Information
- Network Resources
  - Communication media

– Network support

Data	Input that the system takes to produce information.
Hardware	A computer and its peripheral equipment: input, output, and storage devices. Hardware also includes data communication equipment.
Software	Sets of instructions that tell the computer how to take data in, how to process it, how to display information, and how to store data and information.
Telecommunications	Hardware and software that facilitate fast transmission and reception of text, pictures, sound, and animation in the form of electronic data.
People	Information systems professionals and users who analyze organizational information needs, design and construct information systems, write computer programs, operate the hardware, and maintain software.
Procedures	Rules for achieving optimal and secure operations in data processing. Procedures include priorities in running different applications on the computer and security measures.

Figure 1.6 Components of an information system

TYPES OF INFORMATION SYSTEM



1. **Transaction Processing System (TPS)**

Transactions could be externally generated or events internal to an organization.

2. **Management Information System (MIS)**

MIS is an IS which processes data and converts into information.

3. **Decision Support System (DSS)**

A DSS is an IS application that assists decision making.

Elements in DSS: 1. Database, 2. Model base, 3. User interface.

4. **Executive Support System (ESS)**

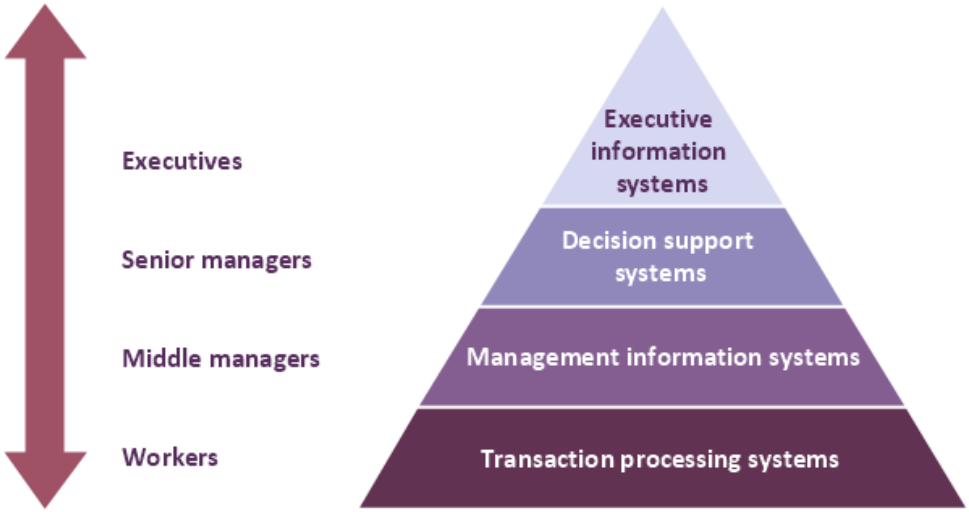
ESS is an extension of the MIS which is a special king of DSS.

5. **Office Automation Systems (OAS)**

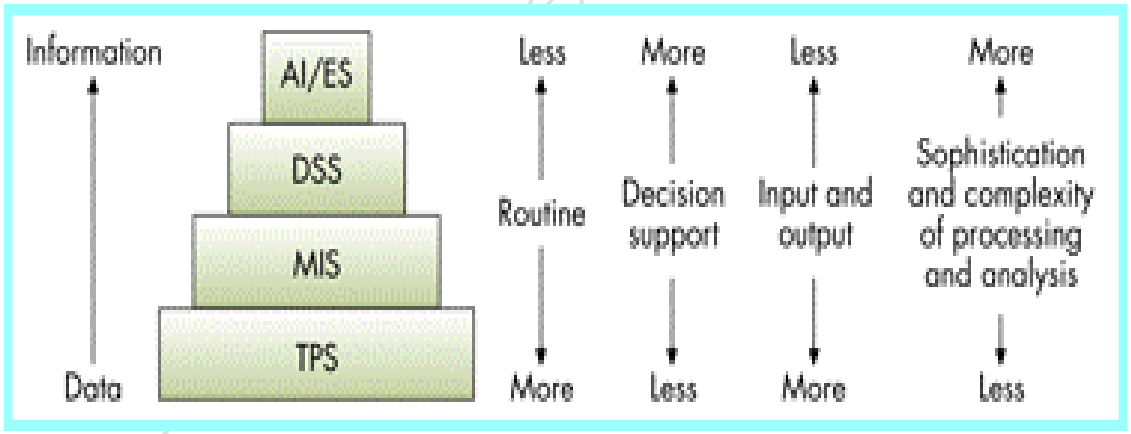
OAS refers to the application of computer and communication technology to office functions. These systems include word processing, e-filling, e-mail, data storage, voice communications, etc..,

6. **Business Expert Systems (BES)**

BES is a knowledge based information systems (KBIS). Its based on Artificial intelligence (AI), are advanced information systems.



Comparison between Information Systems



TRANSACTION PROCESSING SYSTEM (TPS)

Transaction

Basic business operations such as customer orders, purchase orders, receipts, time cards, invoices, and payroll checks in an organization

TPS – Meaning & Objectives

- Perform routine operations and serve as a foundation for other systems
- Provide all the information needed to keep the business running properly and efficiently.
    - Provide timely documents and reports
    - Provide data for other systems
    - Safeguard information

Characteristics of TPS

- Performs routine operations on a regular basis
- Provides data to other systems
- High level of detail, accuracy, security
- Limited support for decision making
- A lot of input and output; large storage needs
- Limited sophisticated or complex processing

Types of TPS

Batch Processing (original)

A system whereby business transactions are accumulated over a period of time and prepared for processing as a single unit or batch.

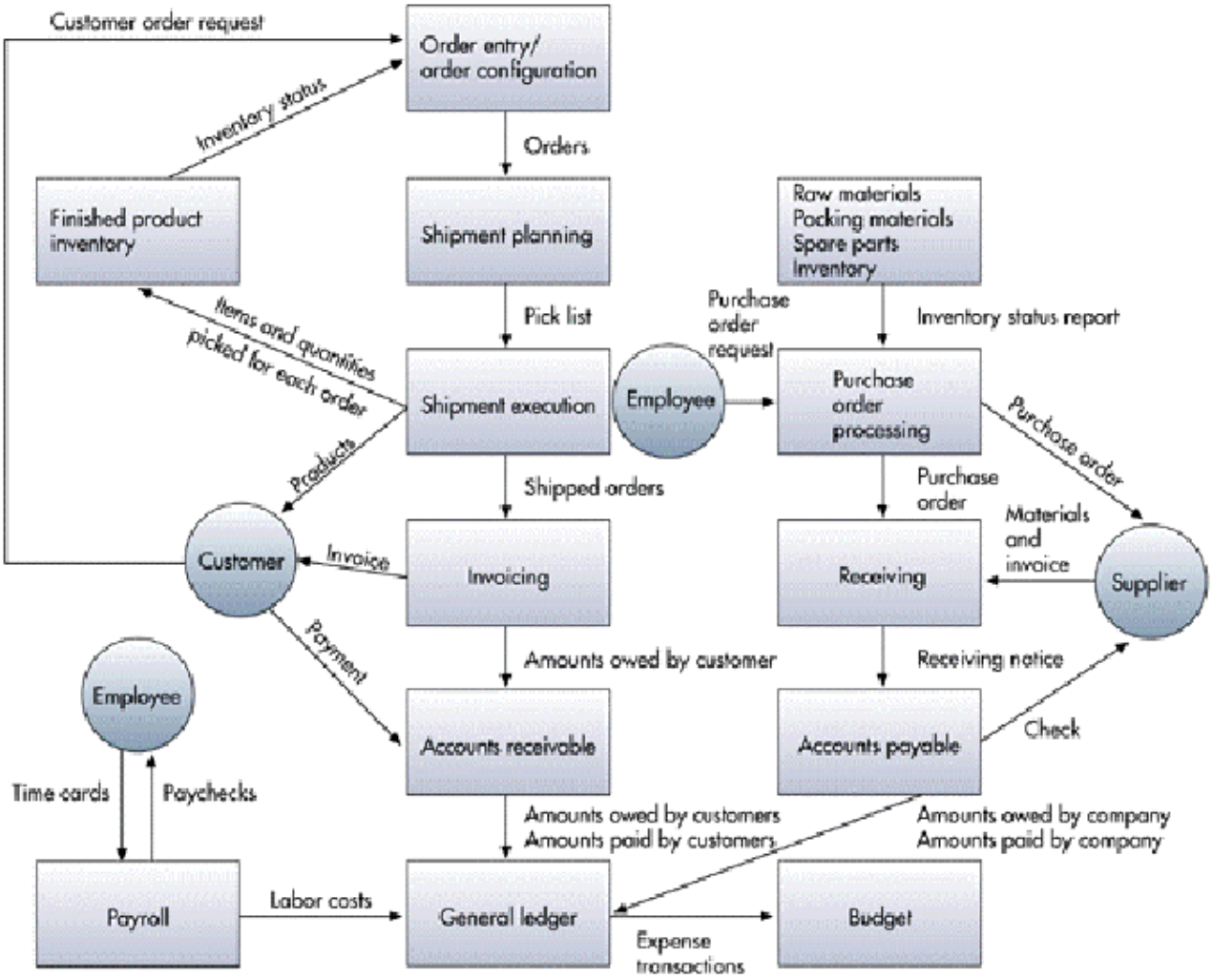
On-Line Transaction Processing (OLTP)

A system whereby each transaction is processed immediately, without the delay of accumulating transactions into a batch. Always current

Steps in TPS

1) Data Collection
   - Begins with a transaction (e.g. an order)
   - Manual or automated
   - Source Data Automation (e.g. bar code scanners)
2) Data Editing
   - Validity and completeness
3) Data Correction
   - Feedback regarding errors
   - Opportunity to re-enter
4) Data Manipulation
   - Performing calculations
   - Classifying
   - Sorting
   - Summarizing
5) Data Storage
   - Updating databases
   - An output of TPS
   - Input to all other systems
6) Document Production
   - Paycheck, Invoices, Packing slips, etc.,

TPS - Example



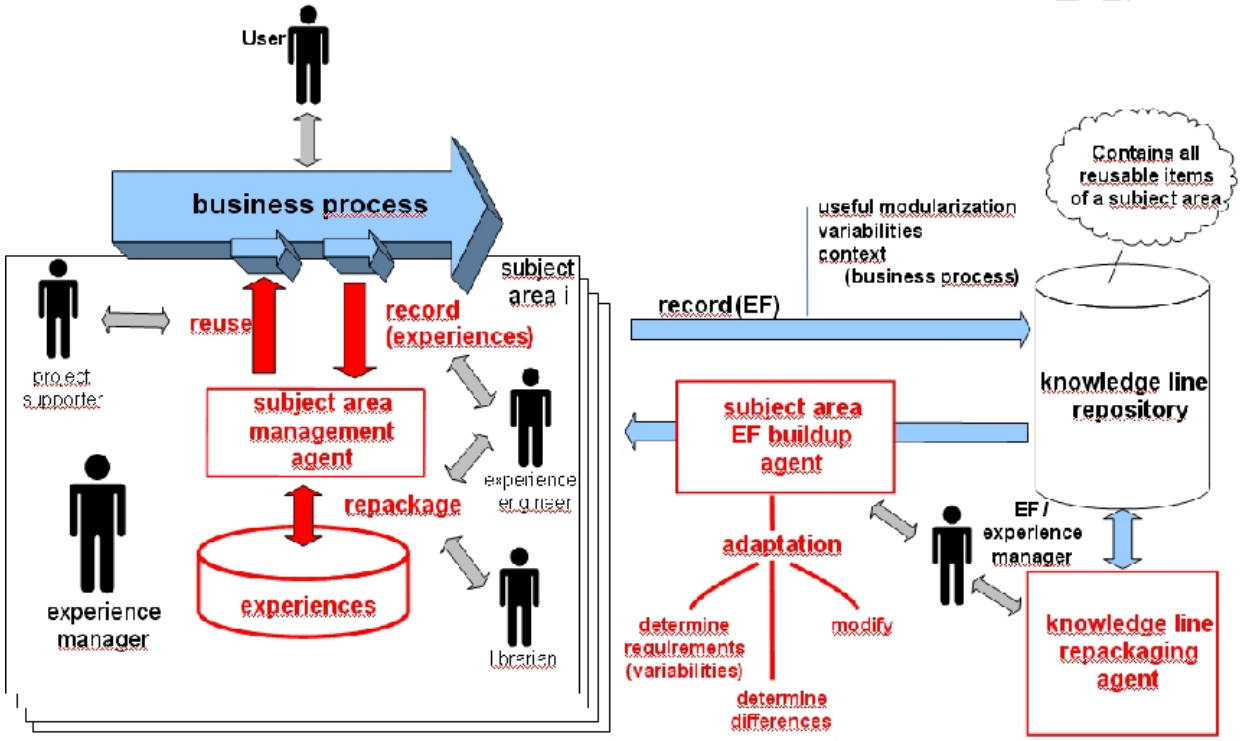
INTELLIGENCE INFORMATION SYSTEM (IIS)

In the AI world, intelligence is generally viewed as encompassing:

- Awareness of (knowledge about and the ability to interact with) the surrounding environment, and
- An ability to learn from experience and adapt accordingly.

1. The first of these criteria presupposes an efficient method of encoding, storing and retrieving knowledge. Several different methods exist for doing so, including if...then (or fuzzy) production rules, frames (schema), semantic Networks.

2. The second criteria raises the issue of "learning"from experience, incorporating such knowledge intoa "Knowledge Base" (KB), and consulting this knowledge when encountering new situations and circumstances, whether consciously or unconsciously (i.e., relying not just on reasoning but also on intuition). It also implies some pattern recognition ability, in order to extrapolate from known situations, to apply heuristics (rules-of-thumb), and to build upon existing knowledge.



Intelligence Information System

- An **expert system** is a computer system that emulates the decision-making ability of a human expert. Expert systems are designed to solve complex problems by reasoning about knowledge, represented primarily as if–then rules rather than through conventional procedural code

Components / Building blocks of an Expert System

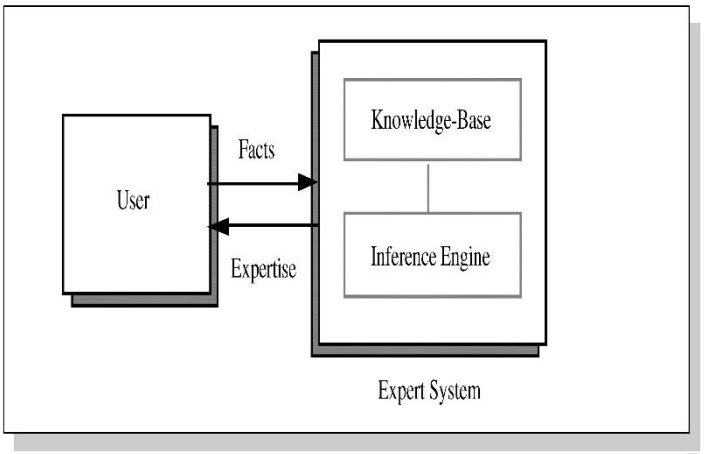


Table 13.1

Applications of AI technologies

Field	Example of an organization	Applications
Energy	Arco & Tenneco	Neural networks used to help pinpoint oil and gas deposits
Government	Internal Revenue Service	Testing a software to read tax returns and spot fraud
Human Services	Merced County in California	Expert systems used to decide if applicants should receive welfare benefits
Marketing	Spiegel	Neural networks used to determine most likely buyers from a long list
Telecommunications	BT Group	Heuristic search used for scheduling application that provides the work schedules of more than 20,000 engineers
Transportation	American Airlines	Expert systems used to schedule the routine maintenance of its airplanes
Inventory/forecasting	Hyundai Motors	Used neural nets and expert systems to reduce delivery time by 20% and increased inventory turns from 3 to 3.4
Inventory/forecasting	SCI Systems	Used neural nets and expert systems to reduce on-hand inventory by 15% resulting in $180 million in annual savings
Inventory/forecasting	Reynolds Aluminum	Used neural nets and expert systems to reduce forecast-ing errors by 2% that resulted in a reduction of one million pounds in inventory
Inventory/forecasting	Unilever	Used neural nets and expert systems to reduce forecasting errors from 40% to 25% yielding resulting in multi-million dollar savings

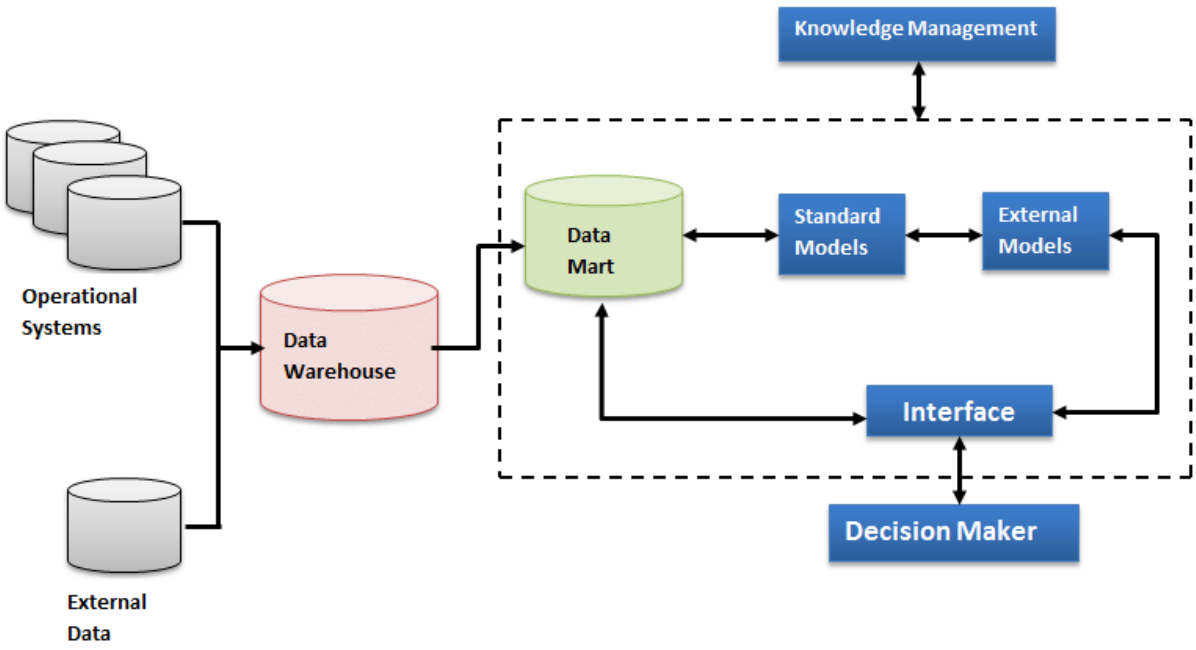
DECISION SUPPORT SYSTEM (DSS)

A decision support system (DSS) is a specific class of computerized information system that supports business and organizational decision-making activities. Properly designed decision support systems are interactive software-based systems 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 business decisions.

DSS Models

1) Optimization model
    - Finding the best solution
2) Satisfying model
    - Finding a good -- but not necessarily the best -- solution to a problem
3) Heuristics
    - Commonly accepted guidelines or procedures that usually find a good solution

DSS process



Characteristics of DSS

- Handles large amounts of data from different sources
- Provides report and presentation flexibility
- Offers both textual and graphical orientation
- Supports drill down analysis
- Performs complex, sophisticated analysis and comparisons using advanced software packages
- Supports optimization, satisficing, and heuristic approaches
- Performs different types of analyses
    - "What-if" analysis
        - Makes hypothetical changes to problem and observes impact on the results
    - Simulation

- Duplicates features of a real system

- Goal-seeking analysis
  - Determines problem data required for a given result

Group Decision Support Systems (GDSS)

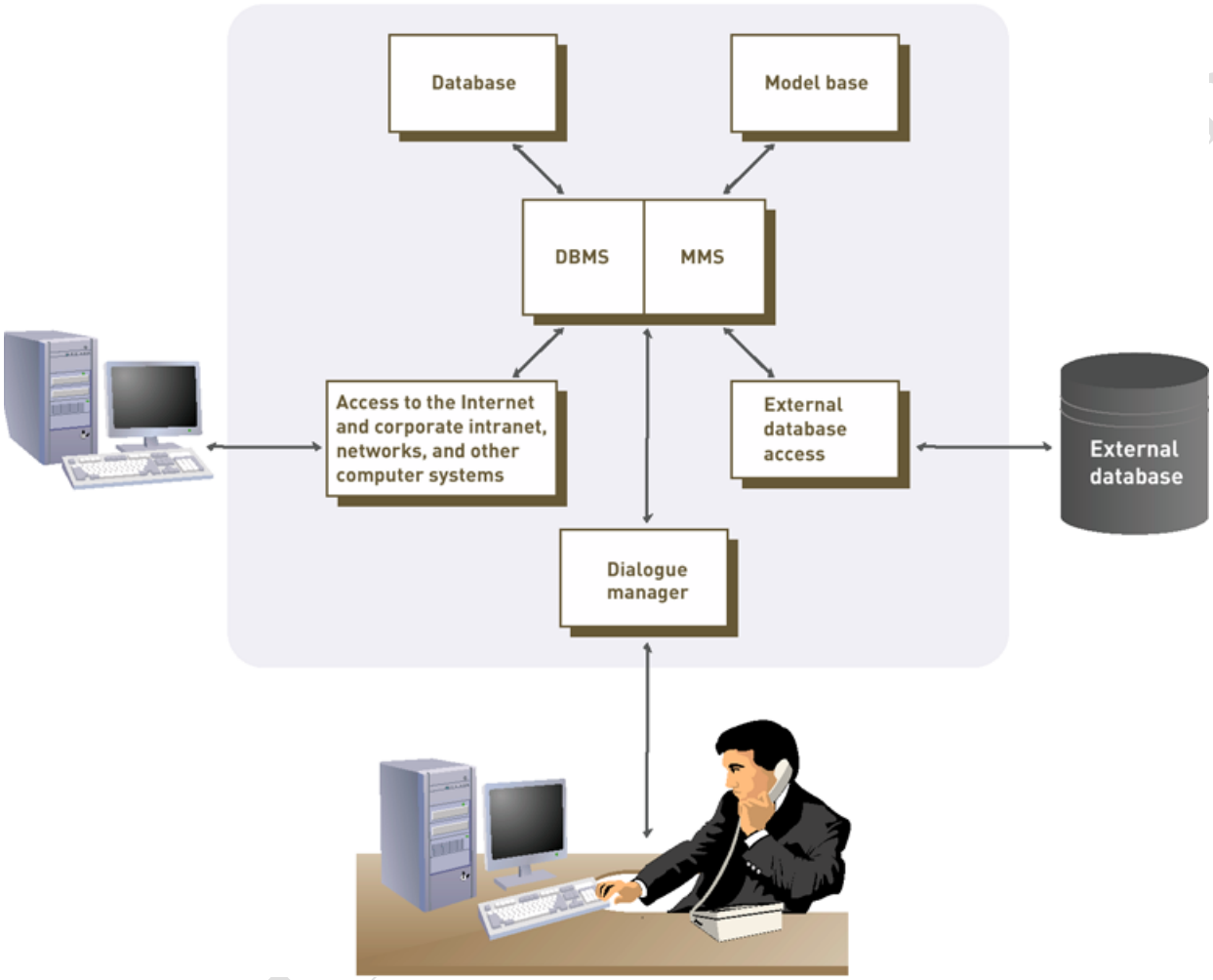
- A group decision support system (GDSS), also called group support system and computerized collaborative work system, consists of most of the elements in a DSS, plus GDSS software needed to provide effective support in group decision-making settings.
- GDSS software, often called groupware or workgroup software helps with joint work group scheduling, communication, and management. One popular package, Lotus Notes, can capture, store, manipulate, and distribute memos and communications that are developed during group projects.

COMPONENTS OF DSS

Key Components of DSS are

- **Database (Management system)**
- **Model base (Management system)**: provides decision makers access to a variety of models and assists them in decision making
- **Dialogue manager (Dialog generation and Management system)**: allows decision makers to easily access and manipulate the DSS and to use common business terms and phrases
- **External database access**

- **Software and Hardware** -Access to the Internet and corporate intranet, networks, and other computer systems



Benefits of DSS

- Improves efficiency and speed of decision-making activities.
- Increases the control, competitiveness and capability of futuristic decision-making of the organization.
- Facilitates interpersonal communication.
- Encourages learning or training.

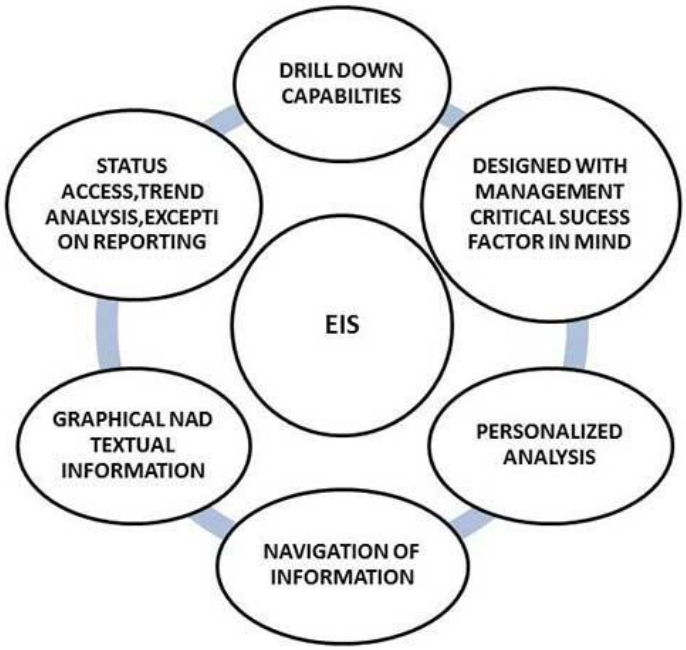
- Since it is mostly used in non-programmed decisions, it reveals new approaches and sets up new evidences for an unusual decision.
- Helps automate managerial processes

EXECUTIVE SUPPORT SYSTEMS (ESS) /

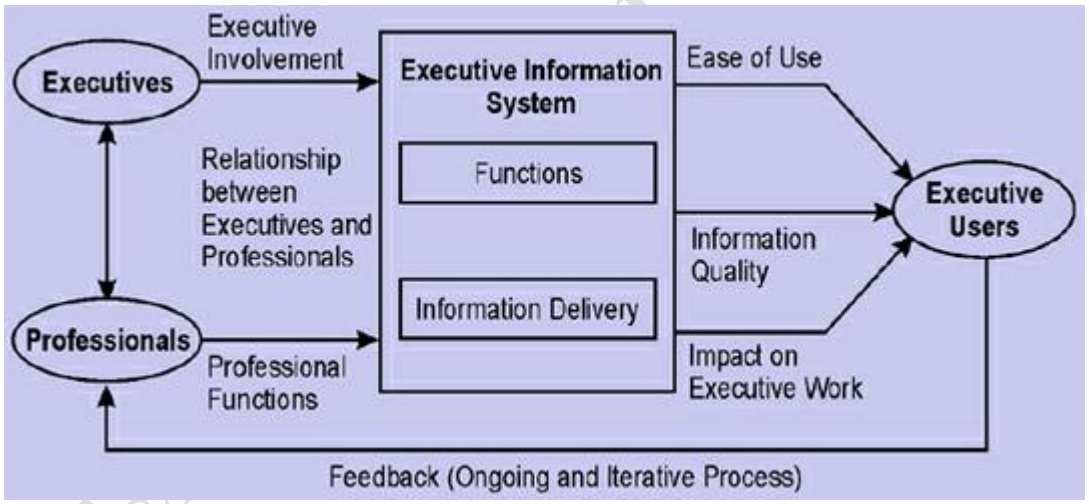
EXECUTIVE INFORMATION SYSTEM (EIS)

- An executive information system (EIS) is a decision support system (DSS) used to assist senior executives in the decision-making process. It does this by providing easy access to important data needed to achieve strategic goals in an organization. An EIS normally features graphical displays on an easy-to-use interface
- As top-level executives often require specialized support when making strategic decisions, many firms have developed systems to assist executive decision making. This type of system, called an executive support system (ESS), is a specialized DSS that includes all hardware, software, data, procedures, and people used to assist senior-level executives within the organization.
- In some cases, an ESS, also called an executive information system (EIS), supports the actions of members of the board of directors, who are responsible to stockholders. An ESS can also be used by individuals farther down in the organizational structure. An ESS is a special type of DSS, and, like a DSS, an ESS is designed to support higher-level decision making in the organization. The two systems are, however, different in important ways. DSSs providea variety of modeling and analysis tools to enable users to thoroughly analyze problems—that is, they allow users to answer questions.

Functions of EIS



Process involved in EIS



Characteristics of ESS:

Tailored to individual executives. ESSs are typically tailored to individual executives; DSSs are

not tailored to particular users. An ESS is an interactive, hands-on tool that allows an executive to focus, filter, and organize data and information.

Easy to use. A top-level executive's most critical resource can be his or her time. Thus, an ESS must be easy to learn and use and not overly complex.

Have drill down abilities. An ESS allows executives to drill down into the company to determine how certain data was produced. Drill down allows an executive to get more detailed information if needed.

Support the need for external data. The data needed to make effective top-level decisions is often external—information from competitors, the federal government, trade associations and journals, consultants, and so on. An effective ESS is able to extract data useful to the decision maker from a wide variety of sources including the Internet and other electronic publishing sources such as LexisNexis.

Can help with situations that have a high degree of uncertainty. There is a high degree of uncertainty with most executive decisions. Handling these unknown situations using modeling and other ESS procedures helps top-level managers measure the amount of risk in a decision.

Have a future orientation. Executive decisions are future oriented, meaning that decisions will have a broad impact for years or decades. The information sources to support future-oriented decision making are usually informal—from golf partners to members of social clubs or civic organizations.

Are linked with value-added business processes. Like other information systems, executive support systems are linked with executive decision making about value-added business processes. For instance, executive support systems can be used by car-rental firms to analyze trends.

Advantages of EIS

- Easy for upper-level executives to use, extensive computer experience is not required in operations
- Provides strong drill-down capabilities to better analyze the given information.
- Information that is provided is better understood
- EIS provides timely delivery of information. Management can make decisions promptly.
- Improves tracking information
- Offers efficiency to decision makers

Disadvantages of EIS

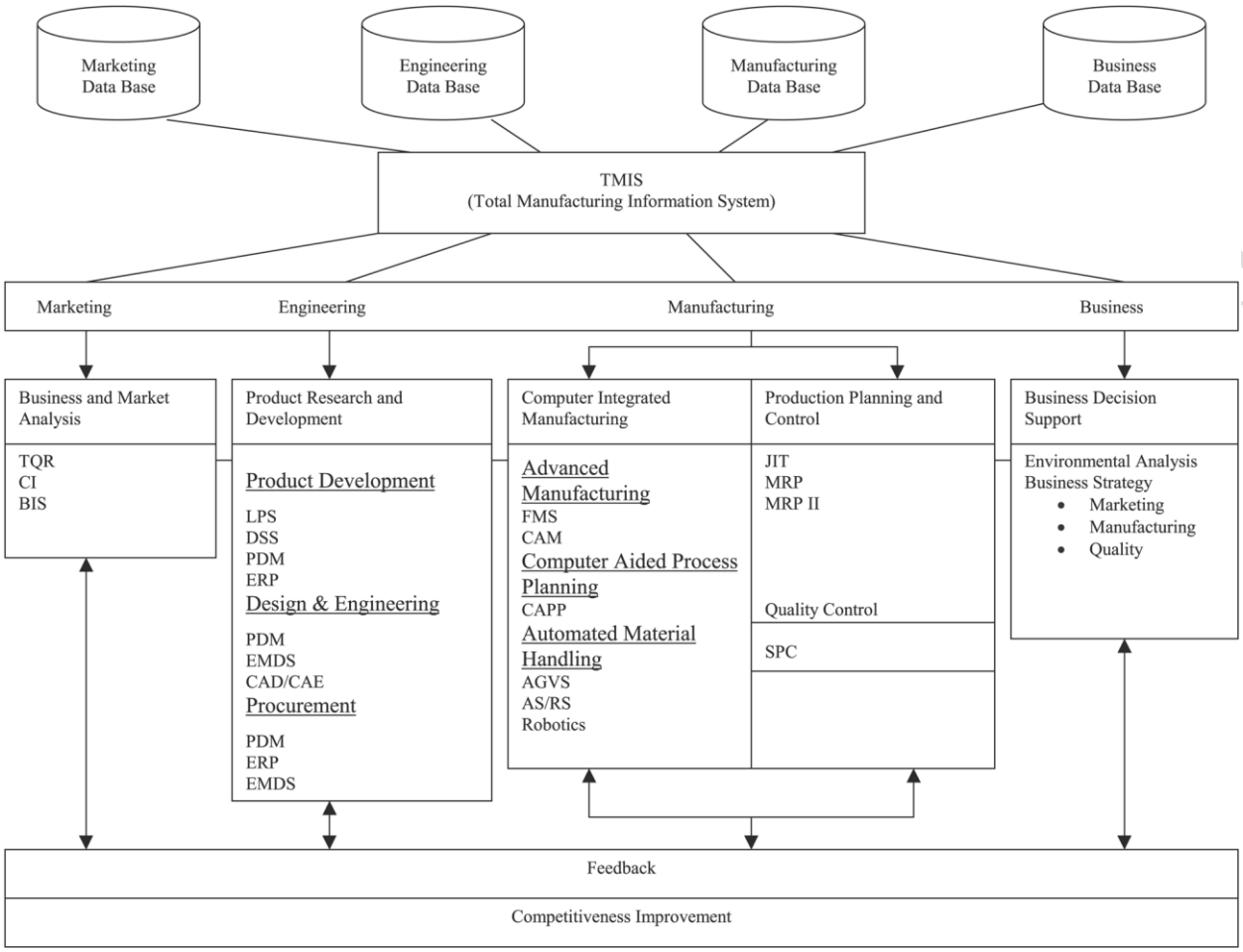
- System dependent
- Limited functionality, by design
- Information overload for some managers
- Benefits hard to quantify
- High implementation costs
- System may become slow, large, and hard to manage
- Need good internal processes for data management
- May lead to less reliable and less secure data
- Excessive cost for small company

UNIT III
FUNCTIONAL MANAGEMENT INFORMATION SYSTEM

1) Production / Operations / Manufacturing Information System
2) Accounting Information System
3) Financial Information System
4) Human Resource / Personnel Information System
5) Marketing Information System

PRODUCTION / OPERATIONS / MANUFACTURING INFORMATION SYSTEM

Manufacturing Information Systems are powerful software platforms capable of tracking the progress of raw materials into finished goods. An integrated MIS enables the control of multiple variables—from inputs to support services, to machines, and personnel—in real time so that management both on the ground and in head offices can optimize production and eliminate inefficiencies.



Benefits of Manufacturing Information System

- Streamlined product production
- Reduced costs, waste, and re-work
- Increased efficiency in set-up times
- Assessment of correct order priority
- Assignment and reassignment of inventory as necessary
- Evaluation of optimal times to turn machines on and off
- Scheduling and rescheduling equipment
- Embedding best practices
- Improving reaction time within the supply change management process
- Making and measuring parts

- Assigning personnel
- Moving inventory from one workstation to another
- Managing suppliers
- Embedding lean and six sigma thinking into your manufacturing process
- Improving efficiency
- Increasing transparency in record-keeping processes
- Audit preparation
- Increasing total output

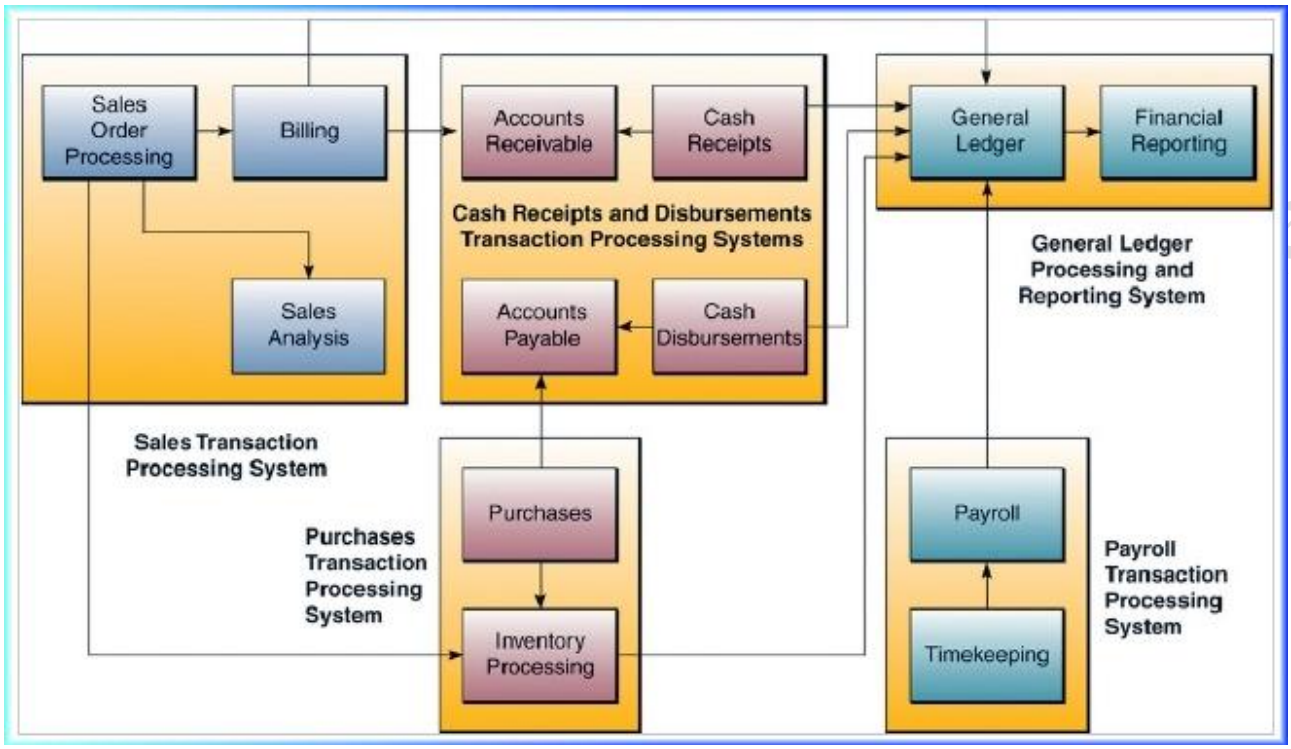
ACCOUNTING INFORMATION SYSTEM

An Accounting Information System (AIS) involves the collection, storage, and processing of financial and accounting data used by internal users to report information to investors, creditors, and tax authorities. It is generally a computer-based method for tracking accounting activity in conjunction with information technology resources

Parts of an Accounting Information System

An accounting information system typically has six basic parts:

1. *People* who use the system, including accountants, managers, and business analysts
2. *Procedure* and instructions are the ways that data are collected, stored, retrieved, and processed
3. *Data* including all the information that goes into an AIS
4. *Software* consists of computer programs used for processing data
5. *Information technology infrastructure* includes all the hardware used to operate the AIS
6. *Internal controls* are the security measures used to protect data



Functions of an Accounting Information System

Accounting information systems have three basic functions:

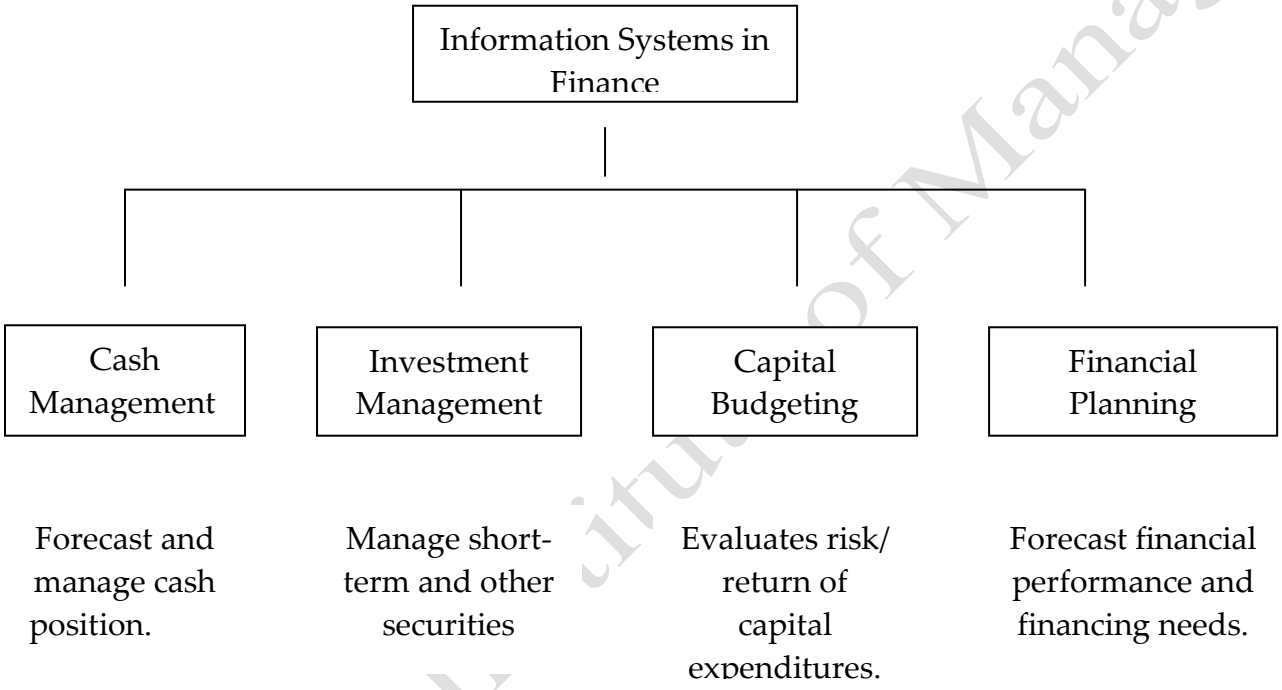
1. The first function of an AIS is the efficient and effective collection and storage of data concerning an organization's financial activities, including getting the transaction data from source documents, recording the transactions in journals, and posting data from journals to ledgers.
2. The second function of an AIS is to supply information useful for making decisions, including producing managerial reports and financial statements.
3. The third function of an AIS is to make sure controls are in place to accurately record and process data.

FINANCIAL INFORMATION SYSTEM

A financial information system is an organized approach to collecting and interpreting information, which is usually computerized. A well-run financial information system is essential to a business, since managers need the resulting information to make decisions about how to run the organization.

- Financial Planning / forecasting
- Capital Budgeting
- Investment Management
- Funds Management
- Working Capital
- Auditing and Control
- Asset Management

Financial Management Systems



Advantages of Financial Information System

- Ensure that there are sufficient funds on hand to pay for obligations as they come due for payment
- Put excess funds to use in appropriate and reasonably liquid investments
- Determine which customers, products, product lines and subsidiaries are the most and least profitable
- Locate the bottleneck areas within the business

- Determine the maximum amount of funds that can safely be distributed to investors in the form of dividends
- Determine the maximum debt load that the organization can sustain

HUMAN RESOURCE / PERSONNEL INFORMATION SYSTEM

A human resource information system (HRIS) is a software package developed to aid human resources professionals in managing data. Human resource professionals utilize these systems to facilitate work flow, improve efficiency and store and collect information. Several companies offer HRIS packages to employers. HRIS packages can be customized to the specific needs and requirements of the employer.

Uses of a Human Resource Information System (HRIS)

Applications of HRIS

- Paid time off (PTO) and attendance
- Pay scale history
- Positions and pay grades
- Overall performance development strategies
- Coaching obtained
- Disciplinary actions
- Personal staff data
- Key staff succession plans
- Identification of prospective staff
- Applicant administration, including interview process and selection

MARKETING INFORMATION SYSTEM

The four main components of Marketing Information System (MIS) are:

1. Internal Records,
2. Marketing Intelligence,
3. Marketing Research (MR), and
4. Marketing Decision Support System.

1. Internal record:

Marketing managers rely on internal reports related to customer orders, sales, price levels, cost, inventory levels, receivable and payables. The heart of the internal record system is the order-to-payment cycle. Customers send orders to the firms.

The sales department prepares invoices and transmits copies to various departments. The billing department sends invoices as quickly as possible. It is the order from the customer that sets the internal record keeping. This record becomes a vital source of information for analysis of sales, inventory levels, profit margins, credit policy to customers, etc.

2. Marketing intelligence system:

The marketing intelligence system is a set of procedures and sources used by the managers to obtain everyday information about marketing environment.

i. Sales force:

Sales representatives are trained to pick information and send it to the concerned manager. They can spot and report new developments.

ii. Distributors, retailers and other intermediaries:

A company can motivate the members of the distribution channel to pass information about shoppers. Information is also collected on sales force behaviour.

iii. External networking:

Managers can attend trade shows, read competitors published reports, talk to employees, and analyse new stories about competitors.

iv. Published data:

A company can take advantage of the government data resources. For instance, census supplies information on changes in population, demographic groups and changing family structure. Similarly, a company can purchase information from professional research agencies such as IMRB, A.C. Nielson Company, etc.

v. Customer feedback:

This is a technique of collecting information at a low cost. The online customer feedback facilities make it more convenient for both the customer and the firm to collect and evaluate information.

3. Marketing decision support system:

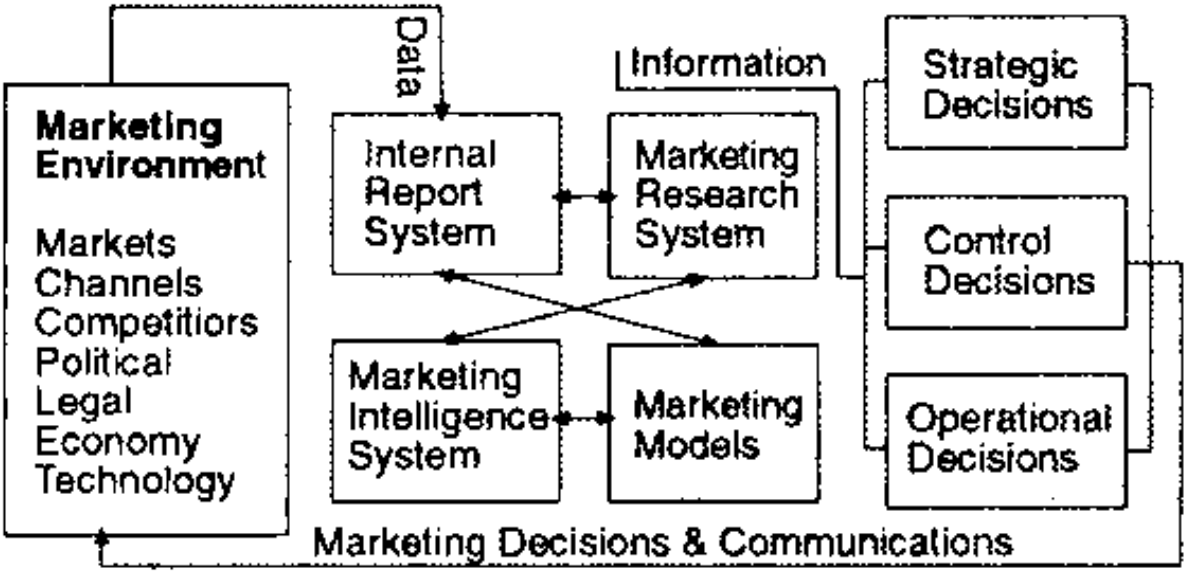
A growing number of organizations are using marketing decision support system to help the managers in taking better decisions. It is a system supported by software and hardware to gather information from business and environment.

It helps managers in providing evidence for the decisions taken by them. The current marketing software programs assist in designing marketing research studies, market segmentation, selling prices, budget, analysing media, and planning sales force activity.

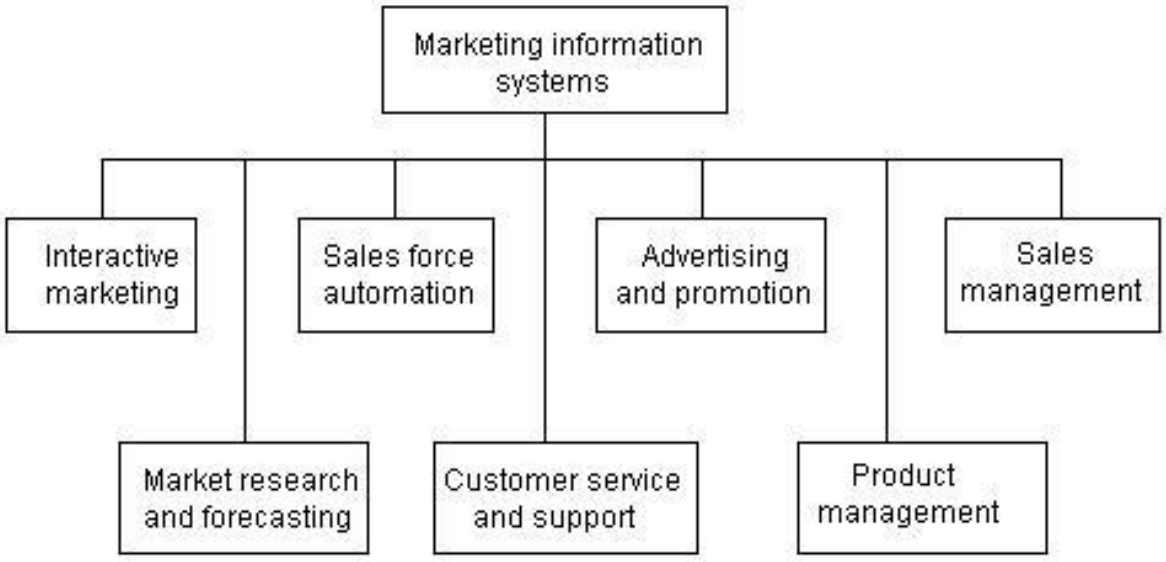
4. Marketing research:

It acts as a tool for accurate decision-making in marketing. It is useful for studying and solving different marketing problems. Marketing research techniques are used by manufacturers, exporters, distributors and service organizations. Marketing research is an applied knowledge. Hence, it provides alternative solutions to deal with a specific problem.

Process



Scope of Marketing Information Systems



Marketing information systems (O'Brien)

Advantages of Marketing information systems

- **Organized Data collection** – MkIS can help the managers to organize loads of data collected from the market, thus results in an increment in the productivity.
- **A broad perspective** – With a proper MkIS in place, the organization can be tracked which can be used to analyze independent processes. This helps in establishing a broader perspective which helps us know which steps can be taken to facilitate improvement.
- **Storage of Important Data** – The storage of important data is essential in execution and thus proves again that MkIS is not important only for information but also for execution.
- **Avoidance of Crisis** – The best way to analyze a stock (share market) is to see its past performance. Top websites like moneycontrol thrive on MIS. Similarly MIS helps you keep tracks of margins and profits. With an amazing information system established, an organizations direction can be analysed and probably crises averted before they place.
- **Co-ordination** – Consumer durables and FMCG companies have huge number of processes which needs to be co-ordinated. These companies depend completely on MIS for the proper running of the organization.
- **Analysis and Planning** – MkIS plays a crucial role in the planning process, considering the planning procedure requires information. For planning, the first thing which is needed is the organizations capabilities, then the business environment and finally competitor analysis. In a proper MkIS, all these are present by default and are continuously updated. Therefore, MkIS is very important for planning and analysis.
- **Control** – Just like MkIS can help in a crisis, in normal times it provides control as you have information of the various processes going on and what is happening across the company."

UNIT IV
SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

SDLC is a sequence of events carried out by analysts, designers and users to develop and implement an information system.

The steps in SDLC are

1) Feasibility study
2) System Analysis
3) System Design
4) Development of software's
5) Systems testing
6) Implementation
7) Maintenance

Systems Development Life Cycle (SDLC) puts emphasis on decision making processes that affect system cost and usefulness. These decisions must be based on full consideration of business processes, functional requirements, and economic and technical feasibility.

- The primary objectives of any SDLC is to deliver quality system which meets or exceed customer expectations and within cost estimates, work effectively and efficiently within the current and planned infrastructure, and is an inexpensive to maintain.
- SDLC establishes a logical order of events for conducting system development that is controlled, measured, documented, and ultimately improved. Any software is not all complete and there are enough rooms to add new features to existing software.

System Study

Preliminary system study is the first stage of system development life cycle. This is a brief investigation of the system under consideration and gives a clear picture of what actually the physical system is? In practice, the initial system study involves the preparation of a **System proposal** which lists the Problem Definition, Objectives of the Study, Terms of reference for Study, Constraints, Expected benefits of the new system, etc. in the light of the user requirements. The system proposal is prepared by the System Analyst (who studies the system) and places it before the user management. The management may accept the proposal and the cycle proceeds to the next stage. The management may also reject the

proposal or request some modifications in the proposal. In summary, we would say that system study phase passes through the following steps:

- problem identification and project initiation
- background analysis
- inference or findings

FEASIBILITY STUDY

In case the system proposal is acceptable to the management, the next phase is to examine the feasibility of the system. The feasibility study is basically the test of the proposed system in the light of its workability, meeting user's requirements, effective use of resources and of course, the cost effectiveness. These are categorized as technical, operational, economic, schedule and social feasibility. The main goal of feasibility study is not to solve the problem but to achieve the scope. In the process of feasibility study, the cost and benefits are estimated with greater accuracy to find the Return on Investment (ROI). This also defines the resources needed to complete the detailed investigation. The result is a feasibility report submitted to the management. This may be accepted or accepted with modifications or rejected. In short, following decision are taken in different feasibility study:

- **Economic feasibility -** The likely benefits outweigh the cost of solving the problem which is generally demonstrated by a cost/ benefit analysis.
- **Operational feasibility -** Whether the problem can be solved in the user's environment with existing and proposed system workings?
- **Organizational feasibility –** Whether the proposed system is consistent with the organization's strategic objectives?

- **Technical feasibility -** Whether the problem be solved using existing technology and resources available?
- **Social feasibility –** Whether the problem be solved without causing any social issues? Whether the system will be acceptable to the society?

Detailed System Study

The detailed investigation of the system is carried out in accordance with the objectives of the proposed system. This involves detailed study of various operations performed by a system and their relationships within and outside the system. During this process, data are collected on the available files, decision points and transactions handled by the present system. Interviews, on-site observation and questionnaire are the tools used for detailed system study. Using the following steps it becomes easy to draw the exact boundary of the new system under consideration:

- Keeping in view the problems and new requirements
- Workout the pros and cons including new areas of the system

All the data and the findings must be documented in the form of detailed data flow diagrams (DFDs), data dictionary, logical data structures and miniature specifications. It includes planning for the new system, analysis of requirement, system constraints, functions and proposed system architecture, prototype of the proposed system and its analysis.

SYSTEM ANALYSIS

Meaning

It is the process of gathering and interpreting facts, diagnosing problems and using the information to recommend improvements in the system.

- **System analysis** is a process of collecting factual data, understand the processes involved, identifying problems and recommending feasible suggestions for improving the system functioning.
- This involves studying the business processes, gathering operational data, understand the information flow, finding out bottlenecks and evolving solutions for overcoming the weaknesses of the system so as to achieve the organizational goals.
- System Analysis also includes subdividing of complex process involving the entire system, identification of data store and manual processes.

The major **objectives of systems analysis** are to find answers for each business process:

- **What is being done?**
- **How is it being done?**
- **Who is doing it?**
- **When is he doing it? Why is it being done?**
- **How can it be improved?**

It is more of a thinking process and involves the creative skills of the System Analyst. It attempts to give birth to a new efficient system that satisfies the current needs of the user and has scope for future growth within the organizational constraints. The result of this process is a logical system design. System analysis is an iterative process that continues until a preferred and acceptable solution emerges.

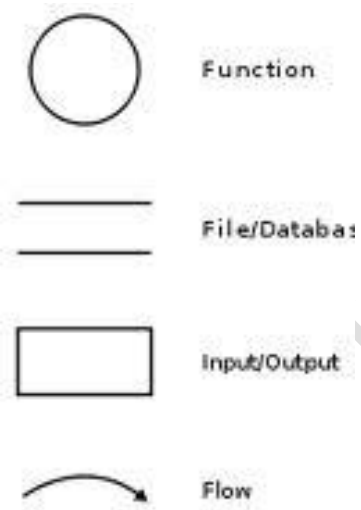
Steps in System Analysis

- The drawing of system flow charts and data flow diagrams.
- The identification of the proposed system's objectives.
- Facts about the system that is going to be replaced.
- An outline of any constraints or limits (e.g. lack of time, money, or staff training).
- An updated cost/benefit analysis.
- An outline of any further developments of the system.

System Analysis Tools

Data Flow Diagram (DFD)

- DFD are widely used graphic tools for describing the movement of data within or outside the system
- These diagrams convey to both software developers and users, how the current system is working and how the proposed system will work



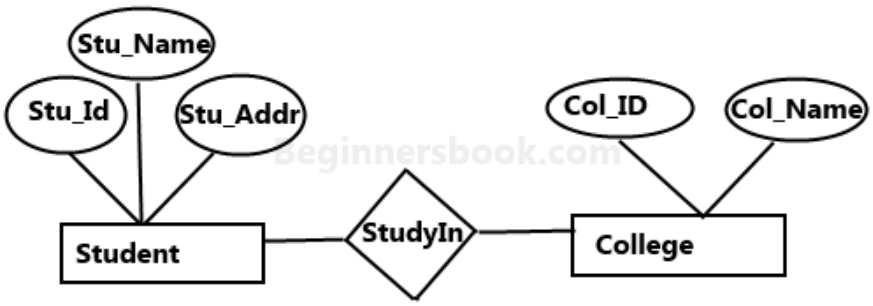
Data Dictionary

A data dictionary is a catalogue of all the elements in a system. It is document that collects, co-ordinates, and confirms what a specific data terms mean to different people in the organisation.

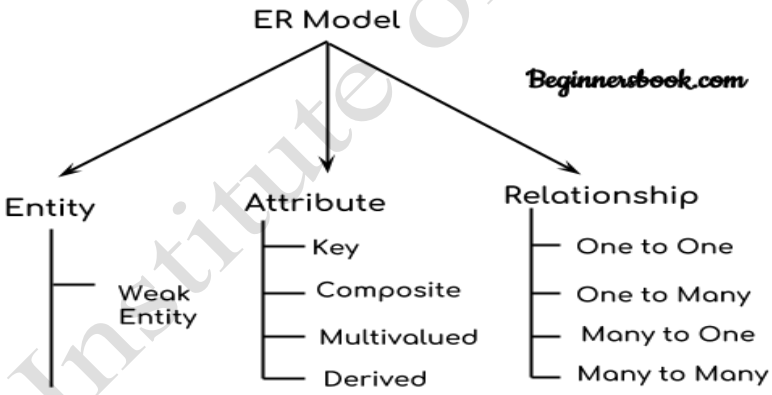
Entity Relationship Diagram (ERD)

ER Diagram or ER model, is a type of structural diagram for use in database design. An ERD contains different symbols and connectors that visualize two important information. **The**

major entities within the system scope, and the inter-relationships among these entities.



Sample E-R Diagram



Components of ER Diagram

Uses of ER Diagram

Database design - Depending on the scale of change, it can be risky to alter a database structure directly in a DBMS. To avoid ruining the data in a production database, it is important to plan out the changes carefully. ERD is a tool that helps. By drawing ER diagrams to visualize database design ideas, you have a chance to identify the mistakes and design flaws, and to make corrections before executing the changes in the database.

Database debugging - To debug database issues can be challenging, especially when the database contains many tables, which require writing complex SQL in getting the information you need. By visualizing a database schema with an ERD, you have a full picture of the entire database schema. You can easily locate entities, view their attributes and identify the relationships they have with others. All these allow you to analyze an existing database and to reveal database problems easier.

Database creation and patching - Visual Paradigm, an ERD tool, supports a database generation tool that can automate the database creation and patching process by means of ER diagrams. So, with this ER Diagram tool, your ER design is no longer just a static diagram but a mirror that reflects truly the physical database structure.

Aid in requirements gathering - Determine the requirements of an information system by drawing a conceptual ERD that depicts the high-level business objects of the system. Such an initial model can also be evolved into a physical database model that aids the creation of a relational database, or aids in the creation of process maps and data flow modes.

System Analyst

- A systems analyst is a person who involves in analyzing the business, identifying opportunities for improvement, and designing information systems to implement these ideas.
- It is important to understand and develop through practice the skills needed to successfully design and implement new information systems.

ROLE OF A SYSTEM ANALYST

1) Estimate cost and time for the project
2) Perform resource planning and scheduling
3) Develop procedural standards for performing tasks
4) Plan and direct acquisitions, training and development of system personnel
5) Perform interview and data gathering
6) Document current system operations
7) Prepare specification for system improvements
8) Develop conversion plans
9) Develop file structures
10) Develop forms and reports
11) Design processing and control procedures
12) Evaluate results

13) Document results
14) Assist in system testing and implementation
15) Fulfill administrative reporting requirements

SYSTEM DESIGN

Meaning

It is the process of planning a new business system or complement an existing system

- Based on the user requirements and the detailed analysis of a new system, the new system must be designed.
- . It is the most crucial phase in the development of a system.
- The logical system design arrived at as a result of system analysis and is converted into physical system design. In the design phase the SDLC process continues to move from the **what** questions of the analysis phase to the **how** .
- The **logical design** produced during the analysis is turned into a **physical design** - a detailed description of what is needed to solve original problem. Input, output, databases, forms, codification schemes and processing specifications are drawn up in detail.
- In the design stage, the programming language and the hardware and software platform in which the new system will run are also decided. Data structure, control process, equipment source, workload and limitation of the system, Interface, documentation, training, procedures of using the system, taking backups and staffing requirement are decided at this stage.

Objectives / Functions of System Design

- Design procedures for data entry
- Design the human-computer interface
- Design system controls
- Design files and/or database
- Design backup procedures

Process of System design.

- **Coding**
  - The system design needs to be implemented to make it a workable system. his demands the coding of design into computer language, i.e., programming language.
  - This is also called the programming phase in which the programmer converts the program specifications into computer instructions, which we refer to as programs.
  - It is an important stage where the defined procedures are transformed into control specifications by the help of a computer language.
  - The programs coordinate the data movements and control the entire process in a system. A well written code reduces the testing and maintenance effort. It is generally felt that the programs must be modular in nature.
  - This helps in fast development, maintenance and future changes, if required. Programming tools like compilers, interpreters and language like c, c++, and java etc., are used for coding .with respect to the type of application. The right programming language should be chosen.
- **Testing**
  - Before actually implementing the new system into operations, a test run of the system is done removing all the bugs, if any. It is an important phase of a successful system.

- After codifying the whole programs of the system, a test plan should be developed and run on a given set of test data.
- The output of the test run should match the expected results. Sometimes, system testing is considered as a part of implementation process.

Using the test data following test run are carried out:

- Program test
- System test
  - **Program test** : When the programs have been coded and compiled and brought to working conditions, they must be individually tested with the prepared test data. All verification and validation be checked and any undesirable happening must be noted and debugged (error corrected).
  - **System Test :** After carrying out the program test for each of the programs of the system and errors removed, then system test is done. At this stage the test is done on actual data. The complete system is executed on the actual data. At each stage of the execution, the results or output of the system is analyzed. During the result analysis, it may be found that the outputs are not matching the expected output of the system. In such case, the errors in the particular programs are identified and are fixed and further tested for the expected output. All independent modules be brought together and all the interfaces to be tested between multiple modules, the whole set of software is tested to establish that all modules work together correctly as an application or system or package.

When it is ensured that the system is running error-free, the users are called with their own actual data so that the system could be shown running as per their requirements.

IMPLEMENTATION

After having the user acceptance of the new system developed, the implementation phase begins. Implementation is the stage of a project during which theory is turned into practice. The major steps involved in this phase are:

- **Acquisition and Installation of Hardware and Software**
- **Conversion**
- **User Training**
- **Documentation**

Acquisition and Installation of Hardware and Software

- The hardware and the relevant software required for running the system must be made fully operational before implementation.
- The conversion is also one of the most critical and expensive activities in the system development life cycle.
- The data from the old system needs to be converted to operate in the new format of the new system.
- The database needs to be setup with security and recovery procedures fully defined.

User Training

During this phase, all the programs of the system are loaded onto the user's computer. After loading the system, training of the user starts. Main topics of such type of training are:

- How to execute the package?
- How to enter the data?
- How to process the data (processing details)?
- How to take out the reports?

After the users are trained about the computerized system, working has to shift from manual to computerized working. The process is called **Changeover**. The following strategies are followed for changeover of the system.

1. **Direct Changeover:** This is the complete replacement of the old system by the new system. It is a risky approach and requires comprehensive system testing and training.
2. **Parallel run** : In parallel run both the systems, i.e., computerized and manual, are executed simultaneously for certain defined period. The same data is processed by both the systems. This strategy is less risky but more expensive because of the following facts:

- Manual results can be compared with the results of the computerized system.
- The operational work is doubled.
- Failure of the computerised system at the early stage does not affect the working of the organization, because the manual system continues to work, as it used to do.

(iii) Pilot run: In this type of run, the new system is run with the data from one or more of the previous periods for the whole or part of the system. The results are compared with the old system results. It is less expensive and risky than parallel run approach. This strategy builds the confidence and the errors are traced easily without affecting the operations.

Documentation

The documentation of the system is also one of the most important activity in the system development life cycle. This ensures the continuity of the system. Generally following two types of documentations are prepared for any system.

- User or Operator Documentation
- System Documentation

User Documentation: The user documentation is a complete description of the system from the user's point of view detailing how to use or operate the system. It also includes the major error messages likely to be encountered by the user.

System Documentation: The system documentation contains the details of system design, programs, their coding, system flow, data dictionary, process description, etc. This helps to understand the system and permit changes to be made in the existing system to satisfy new user needs.

MAINTENANCE

Maintenance is necessary to eliminate errors in the system during its working life and to tune the system to any variations in its working environments. It must meet the scope of any future enhancement, future functionality and any other added functional features to cope up with the latest future needs. It has been seen that there are always some errors found in the systems that must be noted and corrected. It also means the review of the system from time to time. The review of the system is done for:

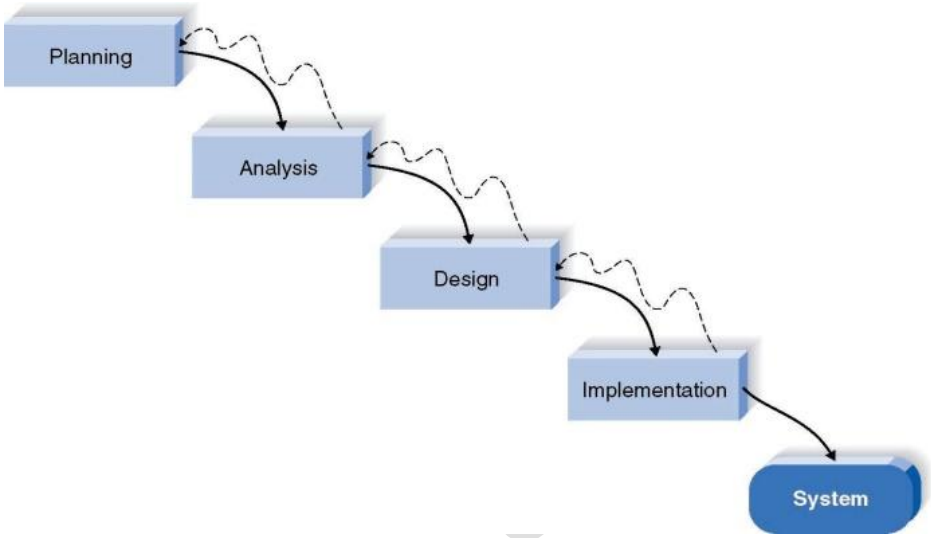
- **knowing the full capabilities of the system**
- **knowing the required changes or the additional requirements**
- **studying the performance.**

If a major change to a system is needed, a new project may have to be set up to carry out the change. The new project will then proceed through all the above life cycle phases.

SYSTEM DEVELOPMENT METHODOLOGIES

A methodology is a formalized approach to implementing the SDLC.
The methodology will vary depending on whether the emphasis is on businesses processes or on the data that supports the business

1. **The waterfall method**



- With waterfall development- based methodologies, the analysts and users proceed sequentially from one phase to the next.
- The two key advantages of waterfall development-based methodologies are:
  - The system requirements are identified long before programming begins.
  - Changes to the requirements are minimized as the project proceeds.
  -

2. **The Parallel Development Method**

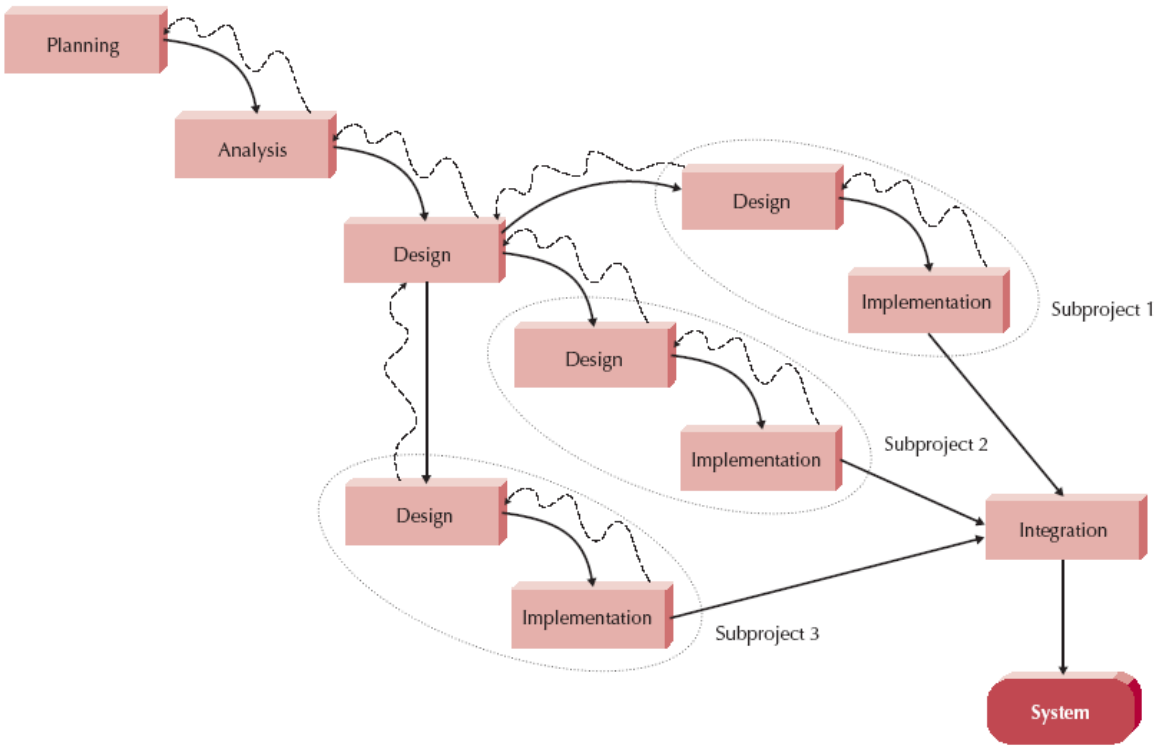


FIGURE 1-3 A Parallel Development-based Methodology

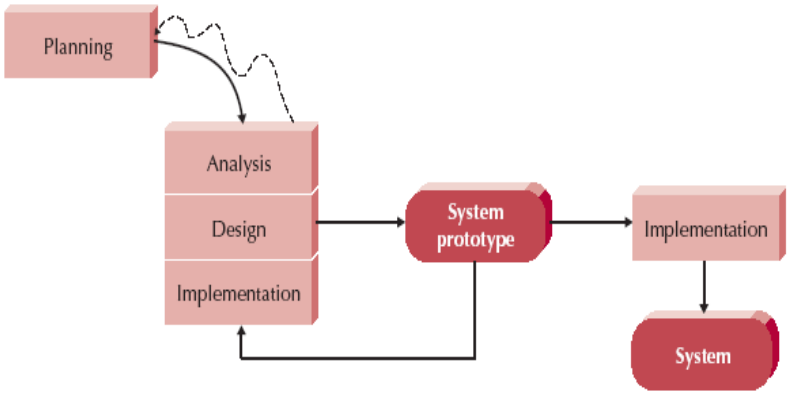
- Addresses problem of time gap between proposal and delivery
- Breaks project into parallel subproject
- Integrates them at the end

3. Rapid Application Method (RAD) - the phased development method

- Critical elements
  - CASE tools
  - JAD sessions
  - Fourth generation/visualization programming languages
  - Code generators
- Break overall system into a series of versions
- Each version has Analysis, Design, and Implementation
- Output from on version is the input to the next
  - Incorporate ideas, issues, lessons learned in one version into the next version

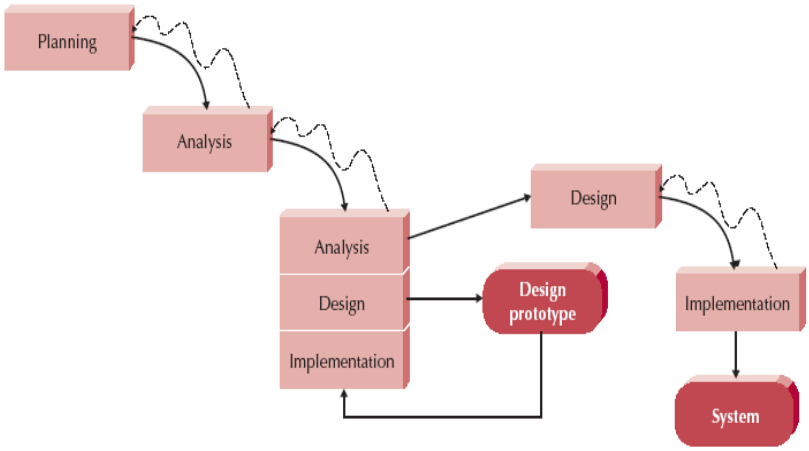
4. RAD - System Prototyping

Prototyping is defined as "the act of building a small-scale, representative or working model of the users requirements to discover or verify those requirements



- Analysis, Design, Implementation are performed concurrently
- Start with a "quick-and-dirty" prototype
- Provides minimal functionality
- Repeat process, refining the prototype each time
- Stop when prototype is a working system

5. Design Prototyping (RAD -Throw away prototyping)



- Use prototypes only to understand requirements
- Example: use html to show UI
- Prototype is not a working design

- Once requirements are understood, the prototypes are thrown away
- The system is then built using SDLC

6. Agile Development

- Just a few rules that are easy to learn and follow
- Streamline the SDLC
- Eliminate much of the modeling and documentation
- Emphasize simple, iterative application development
- Examples include:Extreme Programming (XP),Scrum, Dynamic Systems Development Model (DSDM)

PITFALLS IN MIS DEVELOPMENT

1) Pitfalls in system Analysis

a. Poor defining of problem
b. Lack of communication skill
c. Time and resources not properly allocated
d. Poor staffing
e. Specification poorly documented

2) Pitfalls in Design

a. System is not flexible
b. Drastic changes in roles and procedures
c. Documents poorly done

3) Pitfalls in Coding

a. Time and cost of development underestimated
b. Programmers not given complete specifications
c. Not following proper software engineering concepts

4) Pitfalls in Testing

a. Poor test plan
b. Users not involved in testing

5) Pitfalls in Conversion

a. Inadequate training for users
b. No performance standards

c. Provisions for system maintenance is inadequate
d. System and user documentation is incomplete

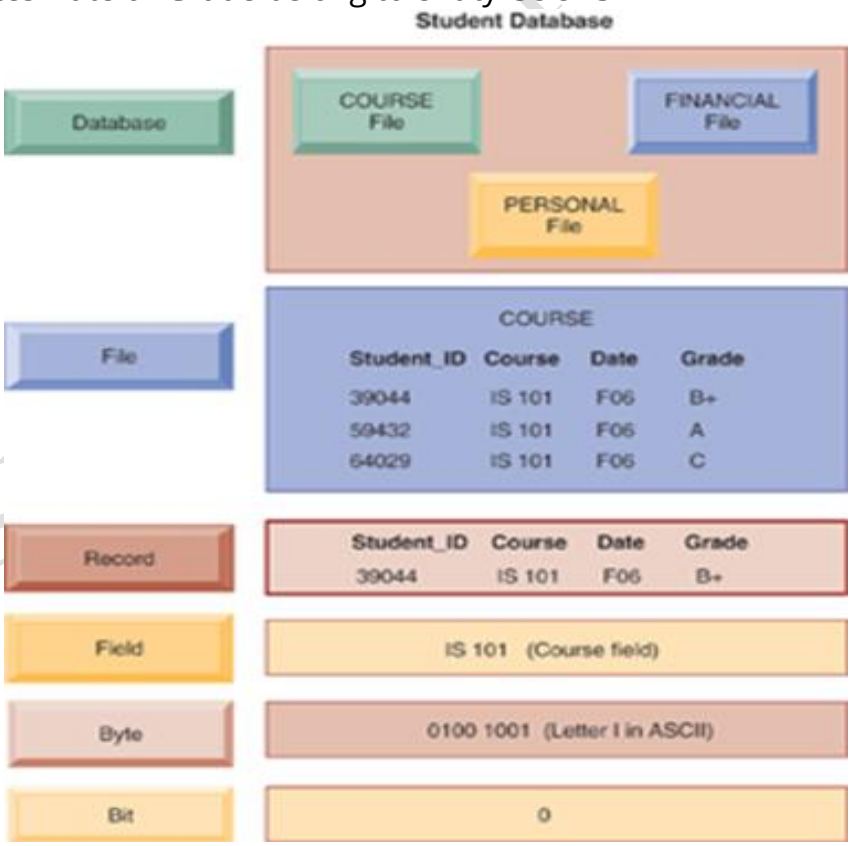
ORGANIZING DATA IN A TRADITIONAL FILE ENVIRONMENT

File organization concepts

Computer system organizes data in a hierarchy

- **Field:** Group of characters as word(s) or number
- **Record**: Group of related fields
- **File**: Group of records of same type
- **Database**: Group of related files
- **Record**: Describes an entity
- **Entity**: Person, place, thing on which we store information
- **Attribute:** Each characteristic, or quality, describing entity

E.g., Attributes Date or Grade belong to entity COURSE



- A computer system organizes data in a hierarchy that starts with the bit, which represents either a 0 or a 1.
- Bits can be grouped to form a byte to represent one character, number, or symbol.
- Bytes can be grouped to form a field, and related fields can be grouped to form a record. Related records can be collected to form a file, and related files can be organized into a database.

Problems with the traditional file environment

- **Data redundancy and inconsistency**

  Data redundancy: Presence of duplicate data in multiple files
  Data inconsistency: Same attribute has different values
- **Program-data dependence:**
  - When changes in program requires changes to data accessed by program
- **Lack of flexibility**
- **Poor security**
- **Lack of data sharing and availability**

DATABASE

A database is collection of information in the digital form related to a particular subject or purpose.

Objectives of Database

1. **Availability :** Data should be available
2. **Share ability:** Data items prepared by one application.
3. **Evolvability:** The database can evolve as application usage.
4. **Data independence:** The users of the database establish their view of the data.
5. **Data integrity:** The database establishes a uniform high level of accuracy.

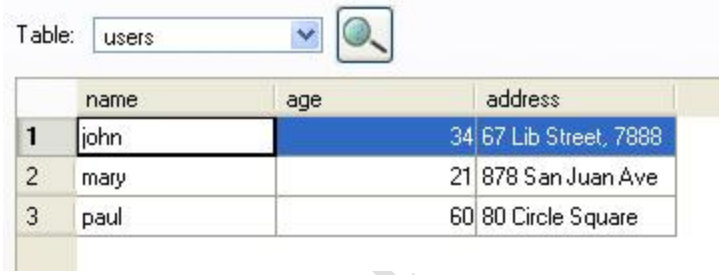
DATABASE STRUCTURES

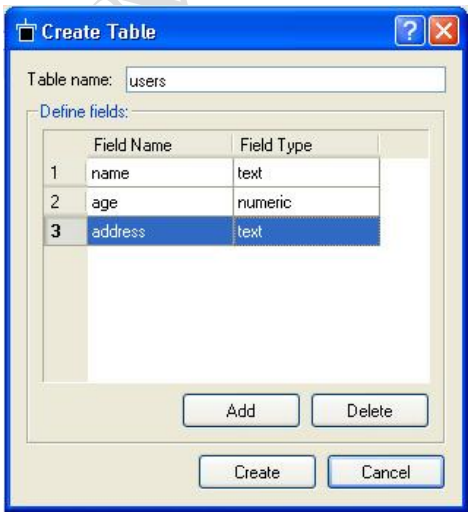
Database structure consists of

- Tables
- Queries
- Forms
- Reports
- Indexes

Tables

- Tables are the structures that store your data in the database. Each table is composed of a number of FIELDS, also known as COLUMNS in some database engines.
- Eg: A table can be created named USERS, with the following fields: NAME, AGE and ADDRESS.





Fields

Field types form a basic type of validation in that the database won't allow you to enter, say, text in a date field

Common field types are:

- whole numbers
- decimal numbers
- text
- dates
- Boolean (or yes/no)

Queries

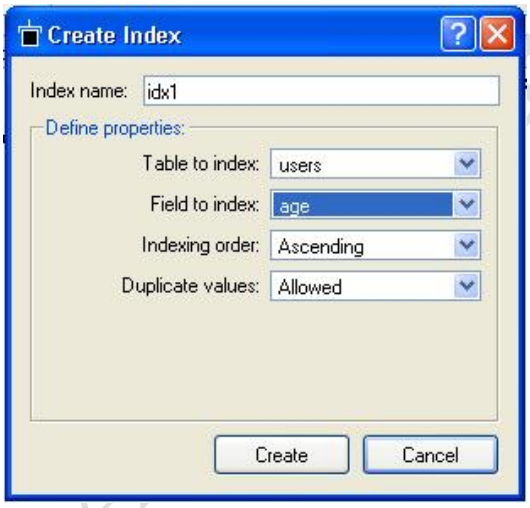
A query can be thought of as a stored question about the data. They are used to filter, sort and summarise data. Special queries called action queries are used to manipulate data and database structure. They can create, delete or modify records and create new tables

Reports

- Reports are designed in a similar way to forms and can get their data either directly from a table or filtered by a query. Reports can alsodisplay data in the form of charts and pivot tables.
- The report tool is ideal for creating a wide range of documents based on the data in your database such as invoices, statements or shipping documents and even envelopes or lists of mailing labels

Indexes

- An index is just like the index in a book - it is an extra bit added on to the database to help the database program find records quickly.
- When creating the records, but you should index all key fields and any fields that you regularly use to search or sort.



DATABASE MANAGEMENT SYSTEMS

A database management system (DBMS) is simply the software the permits an organization to centralize data, manage them efficiently, and provide access to the stored data by application programs.

A database management system has three components:

1. ***Data Definition Language (DDL)***

A data definition language is the formal language programmers use to specify the content and structure of the database.

2. ***Data Manipulation Language (DML)***

This language contains commands that permit and users and programming specialist to extract data from the database to satisfy information requests and develop applications.

3. ***Data Dictionary***

This is an automated or manual file that stores definitions of data elements and data characteristics such as usage, physical representation, ownership and security.

Types of Databases:

1. ***Operational Databases***

Operational databases store detailed data needed to support the business processes and operations of a company.

2. ***Distributed Databases***

Organizations database to network servers at a variety of sites.
It can reside on network servers on the WWW, Intranets or extranets.

3. ***External Databases***

External databases are available for a fee from commercial online services, and with or without charge from many sources on the WWW.

4. ***Hypermedia Databases***

Internet and corporate intranets and extranets has dramatically increased the use of databases of hypertext and hypermedia documents.

5. ***Data Warehouses***

They contain a vast amount of data.

6. ***Unstructured Databases***

The web is emerging as a universal data repository, almost completely unstructured pages.

To allow applications to utilize data from many sources, with possibly widely varying formats.

Design Principles of Database

1. ***Determine the purpose of the database.***

Designing a database is to determine the purpose of the database and how it is to be used.

2. ***Determine the tables needed by the organization in the database***

Designing tables, pieces of information should be divided.

3. ***Determine the fields needed in the tables.***

Table contains information about the same subject, and field in a table contains individual facts about the table's subject.

4. ***Identify the primary/unique keys***

Database must include a field or set of fields that uniquely identifies each individual record in the table.

5. ***Determine the relationships between tables.***

To bring related information together between tables.

DATABASE ADMINISTRATION

Evolving Approaches to Database Administration:

1. Data policies, procedures and standards
2. Planning
3. Data conflict resolution
4. Internal Marketing
5. Managing the information repository
6. Selection of hardware and software
7. Installing and upgrading the DBMS
8. Tuning database performance
9. Improving database query processing performance
10. Managing data security, privacy, and integrity
11. Data backup and recovery

Evolving Approaches to Data Administration:

1. Database planning
2. Database analysis
3. Database design
4. Database implementation
5. Operations and maintenance

Advantages of Database;

1. **Redundancy Control**
   Each application has its own data, which causes duplication of common data items in more than one file.
2. **Data Consistency**
   Updating multiple file management system leads to inaccurate data.
3. **Management Queries**
   It is a convenient approach to handle even unstructured queries.
4. **Data Independence**
   The database approach provides independence between the file structure and program structure.
5. **Enforcement of Standards**
   Data being stored at one central place, standards can easily be enforced.

Disadvantages of Database;

1. **Centralized Database**
   Data structure may become quite complex because of the centralized database supporting many applications in an organization.
2. **More Disk Space**
   Needs more disk space for program storage.
3. **Operationality of the system**
   Whether due to a system fault, database corruption, etc.., all users unable to access the database.
4. **Security Risk**
   Being a centralized database, it is more prone to security disasters.

RELATIONAL DATABASE

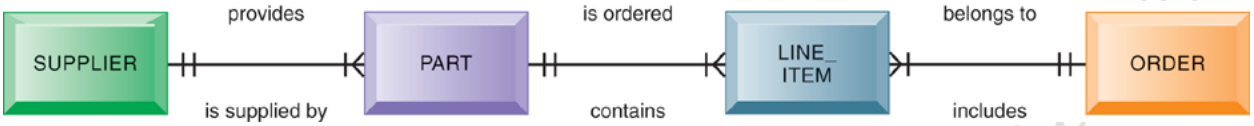
It represents data as two-dimensional tables called relations or files. Each table contains data on entity and attributes

- **Table**: grid of columns and rows
- **Rows (tuples):** Records for different entities
- **Fields (columns):** Represents attribute for entity
- **Key field**: Field used to uniquely identify each record
- **Primary key**: Field in table used for key fields
- **Foreign key**: Primary key used in second table as look-up field to identify records from original table

Establishing Relationships

Entity-Relationship diagram (ER diagram)

- Used by database designers to document the data model
- Illustrates relationships between entities



Relational database tables may have:

- **One-to-one relationship**
- **One-to-many relationship**
- **Many-to-many relationship**

Requires creating a table (join table, Intersection relation) that links the two tables to join information

Normalization

- Process of streamlining complex groups of data to:
- Minimize redundant data elements
- Minimize awkward many-to-many relationships
- Increase stability and flexibility

Referential integrity rules

- Used by relational databases to ensure that relationships between coupled tables remain consistent
- E.g. When one table has a foreign key that points to another table, you may not add a record to the table with foreign key unless there is a corresponding record in the linked table

Operations of a Relational DBMS

Three basic operations used to develop useful sets of data

- **Select**: Creates subset of data of all records that meet stated criteria

- **Join**: Combines relational tables to provide user with more information than available in individual tables
- **Project**: Creates subset of columns in table, creating tables with only the information specified

Object-Oriented DBMS (OODBMS)

- Stores data and procedures as objects
- Capable of managing graphics, multimedia, Java applets
- Relatively slow compared with relational DBMS for processing large numbers of transactions
- **Hybrid object-relational DBMS:** Provide capabilities of both OODBMS and relational DBMS

Capabilities of Database Management Systems

- **Data definition capability:** Specifies structure of database content, used to create tables and define characteristics of fields
- **Data dictionary:** Automated or manual file storing definitions of data elements and their characteristics
- **Data manipulation language:** Used to add, change, delete, retrieve data from database
    - Structured Query Language (SQL)
    - Microsoft Access user tools for generation SQL
- Many DBMS have **report generation capabilities** for creating polished reports (Crystal Reports)

Designing Databases

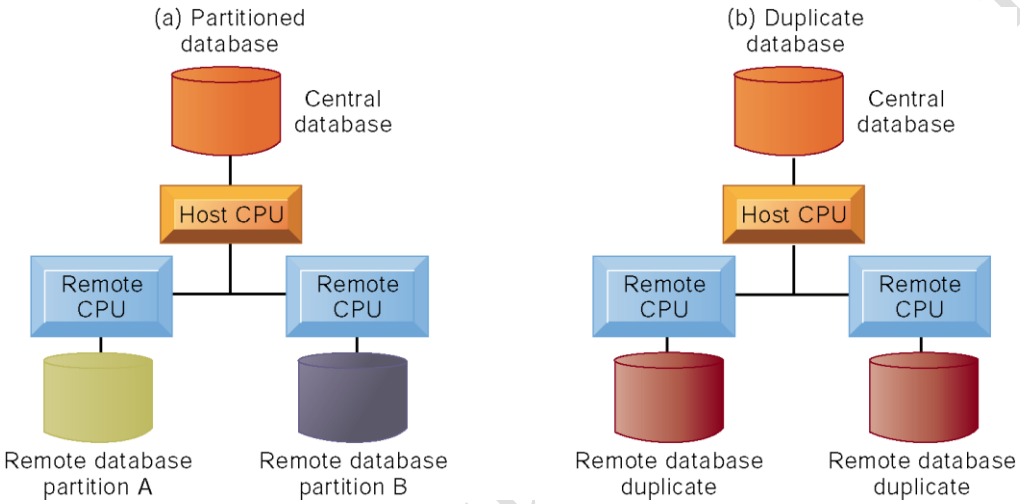
- Conceptual (logical) design: abstract model from business perspective
- Physical design: How database is arranged on direct-access storage devices
- **Design process identifies**
    - Relationships among data elements, redundant database elements
    - Most efficient way to group data elements to meet business requirements, needs of application programs

Database Distribution

- Two main methods of distributing a database
    - **Partitioned**: Separate locations store different parts of database

- **Replicated**: Central database duplicated in entirety at different locations
- Advantages
  - Reduced vulnerability
  - Increased responsiveness
- Drawbacks
  - Departures from using standard definitions
  - Security problems

There are alternative ways of distributing a database. The central database can be partitioned (a) so that each remote processor has the necessary data to serve its own local needs. The central database also can be replicated (b) at all remote locations.

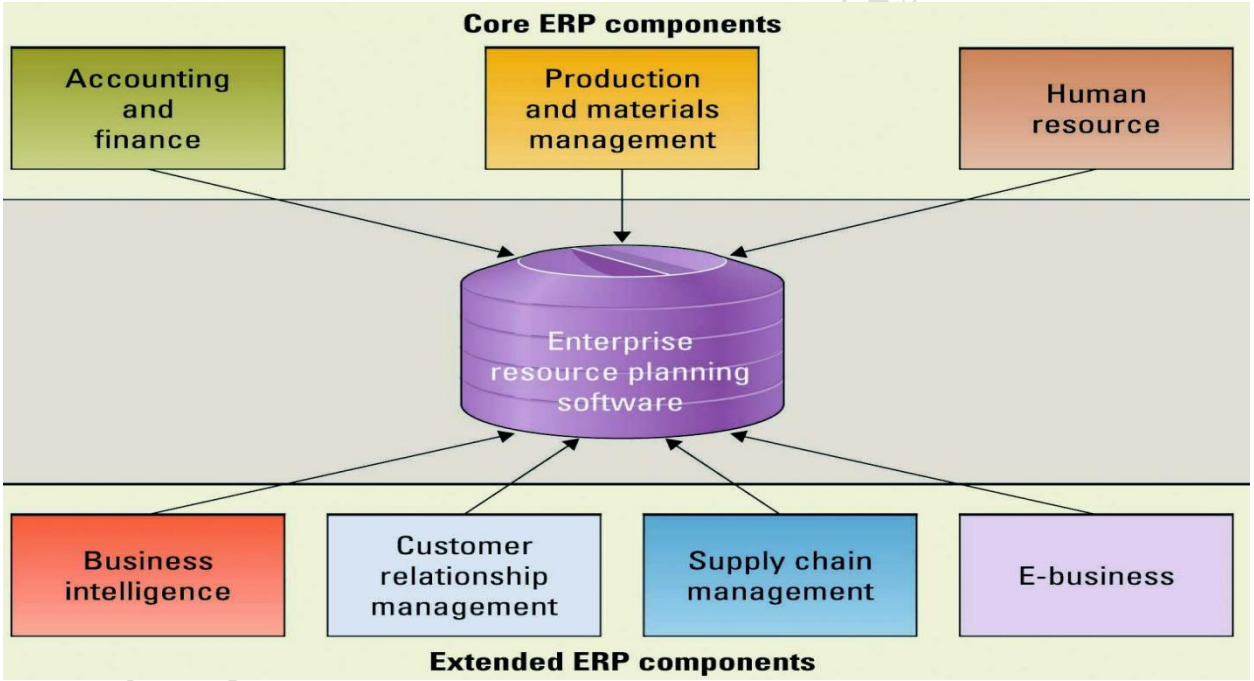


UNIT V
ENTERPRISE RESOURCE PLANNING (ERP)

An ERP system is an attempt to integrate all functions across a company to a single computer system that can serve all those functions' specific needs.

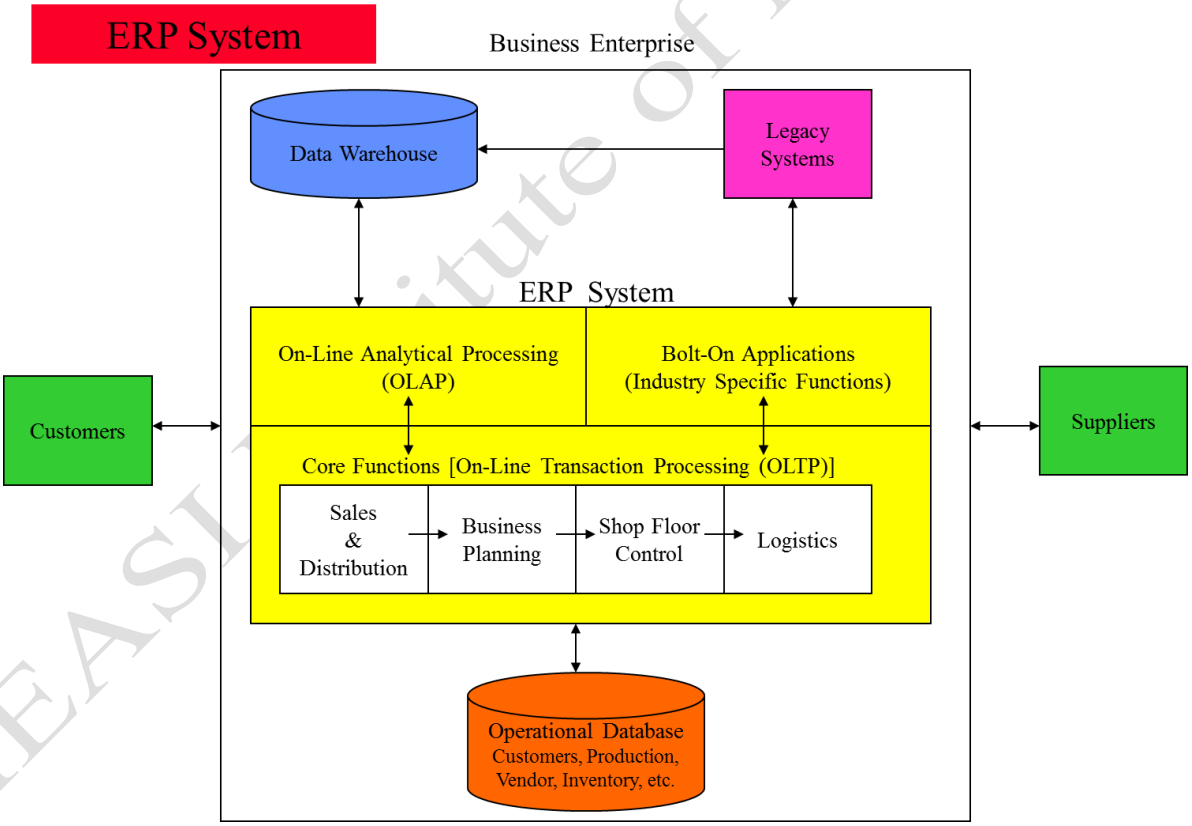
ERP – integrates (or integrated set of IT systems) so that employees can make enterprise wide decisions by viewing enterprise wide information on all business operations (enterprise wide information)

Components of ERP



How ERP works

Software cost: Purchasing the software.
Consulting fees: Hiring external experts to help implement the system correctly.
Process rework: Redefining processes in order to ensure the company is using the most efficient and effective processes.
Customization: If the software package does not meet all of the company's needs, it may be required to customize the software.
Integration and testing: Ensuring all software products, including disparate systems not part of the ERP system, are working together or are integrated. Testing the ERP system includes testing all integrations.
Training: Training all new users.
Data warehouse integration and data conversion: Moving data from an old system into the new ERP system.



ADVANTAGES OF ERP OVER CONVENTIONAL PACKAGES

1) Ease of Integration

- Generally, ERP software facilitates enterprise-wide integrated information system covering every organisational functional area such as accounts, human resources, sales and distribution, marketing, manufacturing among others.
- A standalone business application is limited to a specific functional area, say if it is an accounting function, the application does not seamlessly integrate with other functional areas.
- The main differences between ERP software and standalone business applications are on functionality and characteristics. Unlike the standalone business applications, Enterprise resource planning software not only addresses the current needs of the organisation but also offers continuous opportunity of refining and improving the business processes.

2) Flexibility

- Most organisations deploy ERP software to enhance coordination among various business entities within the same firm as well as business partners. Due to their inflexibility, standalone business applications are not able to go beyond the specific entities in which they are used.
- In addition, ERP software can be centrally managed and necessary controls imposed to ensure proper usage within the entire organisation without interference.

3) Cost-effectiveness

- In as much as a business enterprise would prefer to deploy standalone business applications, they tend to be very costly, especially when you have several entities that need separate applications to facilitate their operations.

- ERP software deployment is cost-effective since the software is modular and an organisation can choose the specific modules that are appropriate to the organisation and in case of future additions, the cost of additional modules cannot be commensurate to setting up a standalone business application when needs arise.

4) Ease of Communication

- ERP software facilitates the integration of all organisational entities thus making it easy for all the entities to share information and communicate with each other. For instance a report generated by the procurement department can easily be shared with the finance office and any other relevant department.
- Most ERP systems come with enhanced communication facilities to enable ease of communication. On the other hand, a standalone business application does not support communication with other organisational entities and in case a report is generated, it cannot be shared unless it is printed or emailed.

NEED FOR ERP

- Integrate financial information
- Integrate customer order information
- Standardize and speed up operations processes
- Reduce inventory
- Standardize Human Resources information

POTENTIAL BENEFITS OF ERP

- Integration of a single source of data
- Common data definition
- A real-time system
- Increased productivity

- Reduced operating costs
- Improved internal communication
- Foundation for future improvement
- Improved customer service and order fulfillment
- Improved communication with suppliers and customers
- Enhanced competitive position
- Increased sales and profits

CHALLENGES OF ERP

- Limitations of ERP technical capabilities
- Inconsistency with existing business processes
- Costs - implementation (hardware, software, training, consulting) and maintenance
- Impact on organizational structure (front office vs. back office, product lines, etc.)
- Changes in employee responsibilities

SELECTION CRITERIA FOR ERP PACKAGES

1. Meet functional requirements. The first analysis to do is mapping the functional requirements with the system capabilities. When doing this exercise, it is important to distinguish *must have* from *nice to have* needs and prioritize them accordingly. ERP implementations are usually phased and it is recommended to focus on *must have* requirements in the initial phase, leaving more advanced or complex needs for later phases.

2. Platform flexibility and scalability. Although we might have a clear list of functional requirements that need to be addressed during the implementation, the reality is that some of the current organization's needs probably won't be fully covered with standard features or

new needs will appear in the future. We need to be sure that it will be possible to address them. Software flexibility and scalability will remove possible limitations in the present and in the future.

3. Ease of use and intuitive user interface. Usability is a very important criterion that needs to be taken into account. In the end, the easier the system is to use, the greater return it will provide. Users need to be productive and self-sufficient when recording new transactions and searching for the information they need. This will even have an impact on customer service quality.

4. Innovative technology. As ERP systems have a long lifespan, it is important that their technology is innovative enough to not to become obsolete too early. Technology evolves very quickly and what can be enough today, might be a bottleneck in the future. Currently, cloud-ready solutions that can be accessed from anywhere and any device are a must.

5. Competitive pricing and flexible financing. The ERP implementation will be an investment that will provide a return. As with any investment, it is important that costs are properly distributed over time. If possible, it is advisable to avoid big upfront investments and go with a model that allows you to pay a similar amount every year.

6. Similar customer references. Certainly, your company or organization will not be the first one in your market segment willing to adopt specific ERP software. Another proof of having made the right selection is knowledge of other similar companies or organizations using the same solution.

7. Local implementer and support. Choosing the right software is important, but working with the right partner is key. In an ERP project, there are 3 elements that are equally important: product, implementer and company involvement. Make sure your implementer is experienced in both the business and technology areas and can provide local support when needed.

8. ERP vendor backup. An additional guarantee that the implementer will be able to provide the right support you need is having ERP vendor support. Working with an official vendor *partner* is essential. Ask for the SLAs the vendor has agreed with your implementer when receiving support.

9. Freedom to access source code. Once you are sure you will work with the right implementer and vendor, make sure you will have enough freedom to change them if needed. Being able to access the source code and using standard languages will be a guarantee of freedom in case you need to find another *partner*.

10. Compelling product roadmap. Finally, it is also advisable to look at the product roadmap for the coming years to check if the vendor's vision is aligned with yours and your future business plans. Make sure the ERP software will also evolve from a technology perspective so that you can benefit from future innovations in this field in addition to new features.

ERP IMPLEMENTATION APPROACHES

- The big bang – install a single ERP system across the entire organization
- Franchising – Independent ERP systems are installed in different units linked by common processes, e.g., bookkeeping.
- Slam dunk – install one or several ERP modules for phased implementation of key business processes

STEPS IN ERP IMPLEMENTATION

- **Plan & Monitor** – Consists of processes that involve developing a strategy to complete the work, as well as measure the progress and take corrective action as required. This occurs throughout the entire process.

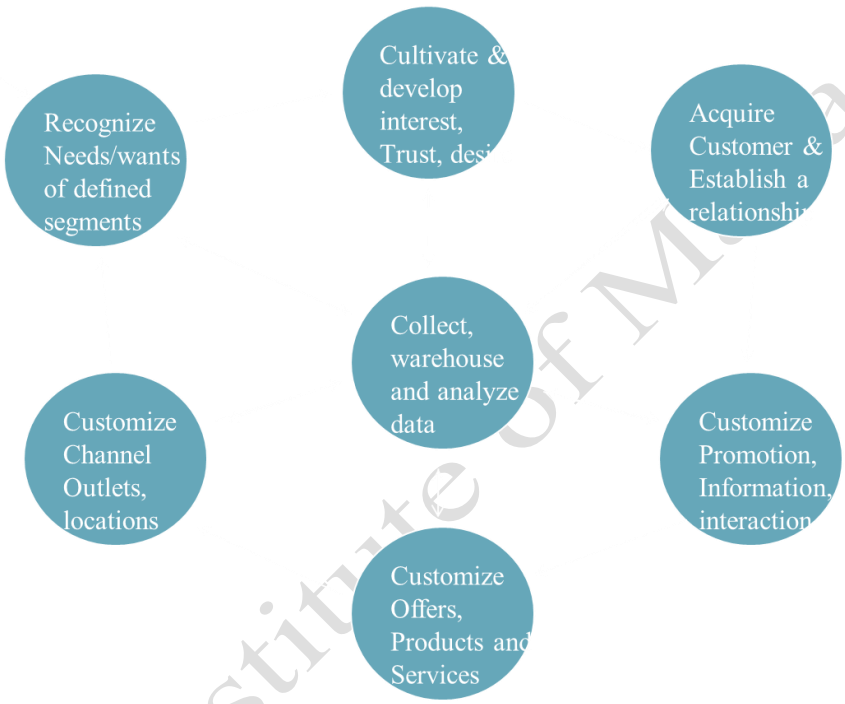
- **Analyze** – This stage is a more detailed level of discovery and consists of processes that involve gathering detailed requirements and analyzing the client's business needs.
- **Build** – Involve processes that carry out the tasks identified in the strategy.
- **Stabilize** – Consists of a set of processes to ensure a solution meets the client's requirements and is ready for full deployment to a live production environment. This also includes a client's readiness to use the solution.
- **Deploy** – Processes that will deploy the solution to a production environment.
- **Post Go Live** – Processes that are in place to support the client once they are live on the solution, which lead to project closure.

Few ERP's

Vendor/Web Address	ERP Specialties/Characteristics	Target Market
SAP www.sap.com	Customer relationship management, financial management, human resource management, and supply chain management	Large business
Oracle/PeopleSoft www.oracle.com	Financial management, human resource management, and supply chain management	Large business
SSA Global (Baan) www.ssaglobal.com	Customer relationship management, financial management, human resource management, and supply chain management	Large business
Microsoft (Great Plains) www.microsoft.com	Financial management, distribution, manufacturing, project accounting, human resource management, and business analytics	Small-to-medium business

Customer Relationship Management

- CRM "is a business strategy that aims to understand, anticipate and manage the needs of an organisation's current and potential customers
- The approach of identifying, establishing, maintaining, and enhancing lasting relationships with customers
- CRM is a shift from traditional marketing as it focuses on the retention of customers in addition to the acquisition of new customers



Strategies

- Prospecting (of first-time consumers)
- Loyalty
- Cross-selling / Up-selling
- Win back or Save
-

Phase / Modules of CRM:

- Marketing
- Sales
- Services

Business-to-business (B2B)

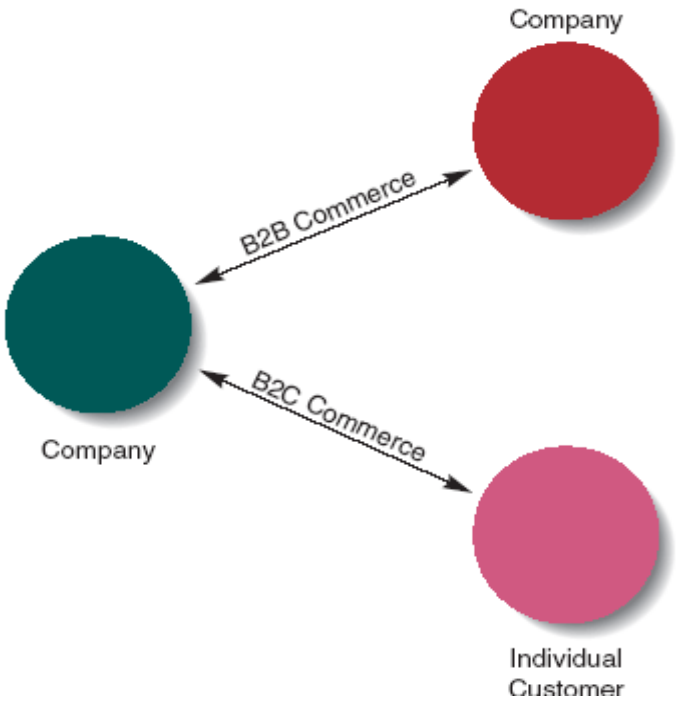
trade that takes place between companies using IT and the Internet to link and coordinate the value chains of different companies

B2B marketplace

Internet-based trading platform set up to connect buyers and sellers in an industry

Business-to-customer (B2C)

trade that takes place between a company and individual customers using IT and the Internet



IMPORTANCE OF CRM

- Help marketing departments identify and target their best customers, manage campaigns as well as discover qualified leads. whatis.com
- Qualified Leads: prospects who seem most likely to buy because of some information known about them. Duncan, Tom
- Improve sales and streamline existing processes.
- Form individualized relationships with customers.
- Give employees information needed to improve customer service and also to better understand customer needs

BENEFITS OF CRM

- **Customer Focus** : learn enough about the customer
- Retention : firm satisfies customer and offer variety such that customer repeats transactions. It cost six times more to get a new customer than to retain one. Higher retention rates increases revenue and reduces costs.
- **Cross selling** : marketing complementary products to existing customers
- **Up-selling** : higher value customers to existing/new customers
- **Long Term profitability** : customer focus, retention of loyal customers and greater share
- of customer implies long term profit.

TRENDS IN CRM

- Customer engagement will move into mainstream B2C and B2B
- Integration, Automation, Intelligence
- Predictions: Understanding the behavior of the customer
- Convergence with other big trends

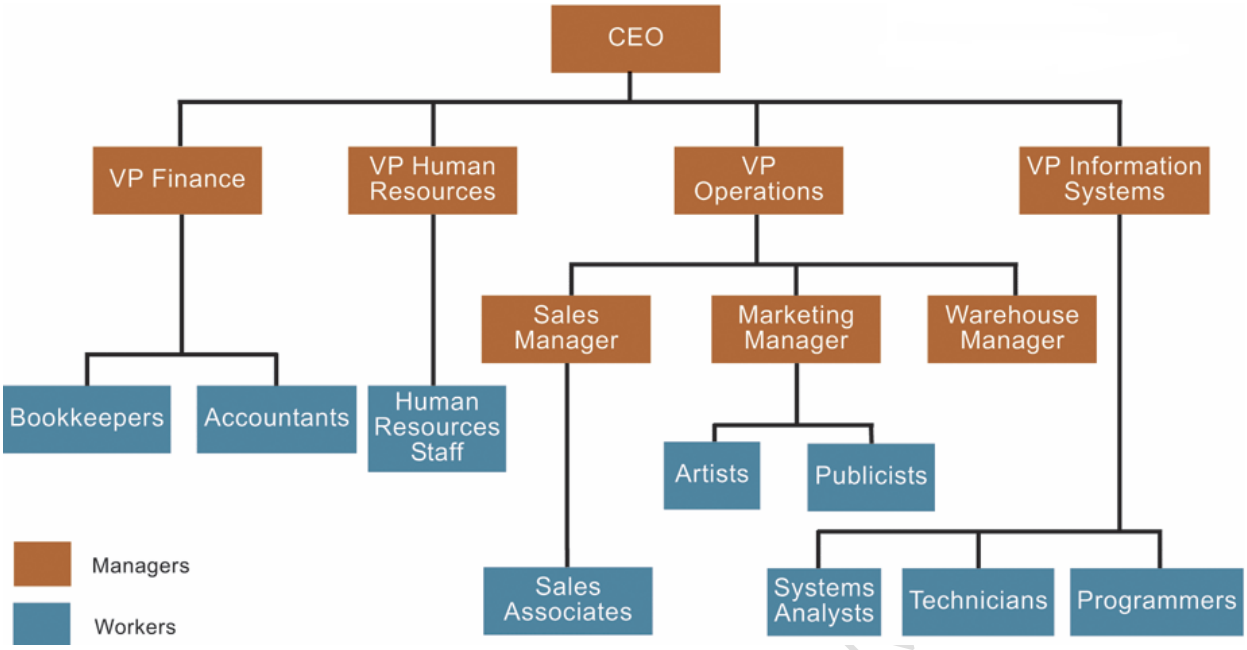
An organization is a stable, formal social structure that takes resources from the environment and processes them to produce output.

TYPES OF ORGANISATION

Mint berg's classifications, described below. Identify five basic of organizations.

1. **Entrepreneurial Structure:** Young, small firm in a fast changing environment.
2. **Machine Bureaucracy:** Large bureaucracy existing in a slowly changing environment.
3. **Divisionalized Bureaucracy:** Combination of multiple machine bureaucracies.
4. **Professional Bureaucracy:** Knowledge based organization where goods and services depend on the expertise and knowledge of professionals.
5. **Adhocracy:** "Task force" organization that must respond to rapidly changing environments.

ORGANISATION STRUCTURE AND HIERARCHY



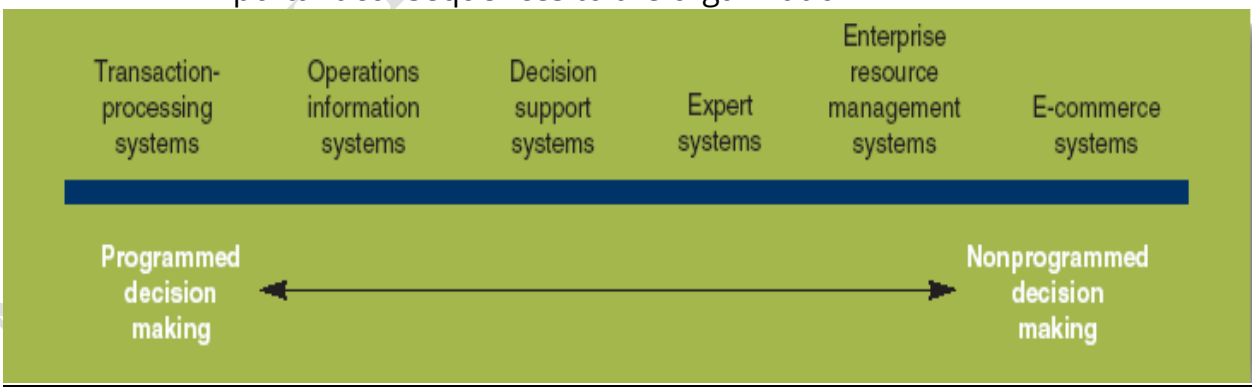
MANAGERIAL DECISION MAKING

Programmed Decisions

- Situations occurred often enough to enable decision rules to be developed and applied in the future
- Made in response to recurring organizational problems

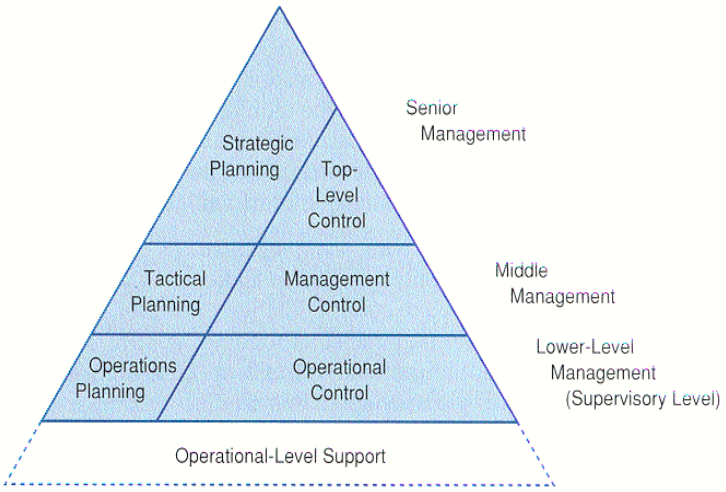
Non programmed Decisions

– in response to unique, poorly defined and largely unstructured, and have important consequences to the organization



DECISION MAKING MODELS

1) **Classical Model (Normative)**
   a. Decision maker operates to accomplish goals that are known and agreed upon
   b. Decision maker strives for condition of certainty – gathers complete information
   c. Criteria for evaluating alternatives are known
   d. Decision maker is rational and uses logic
2) **Administrative Model (Descriptive)**
   a. Decision goals often are vague, conflicting and lack consensus among managers;
   b. Rational procedures are not always used
   c. Managers' searches for alternatives are limited
   d. Managers settle for a satisficing rather than a maximizing solution
   e. intuition, looks to past experience
3) **Political Model (Coalition)**
   a. Closely resembles the real environment in which most managers and decision makers operate
   b. Useful in making non-programmed decisions
   c. Decisions are complex
   d. Disagreement and conflict over problems and solutions are normal



Decision Making at various level

STAGES /PHASES OF DECISION MAKING

1. **Intelligence Stage:** MIS designed so as to answer pre-specified and evaluated.

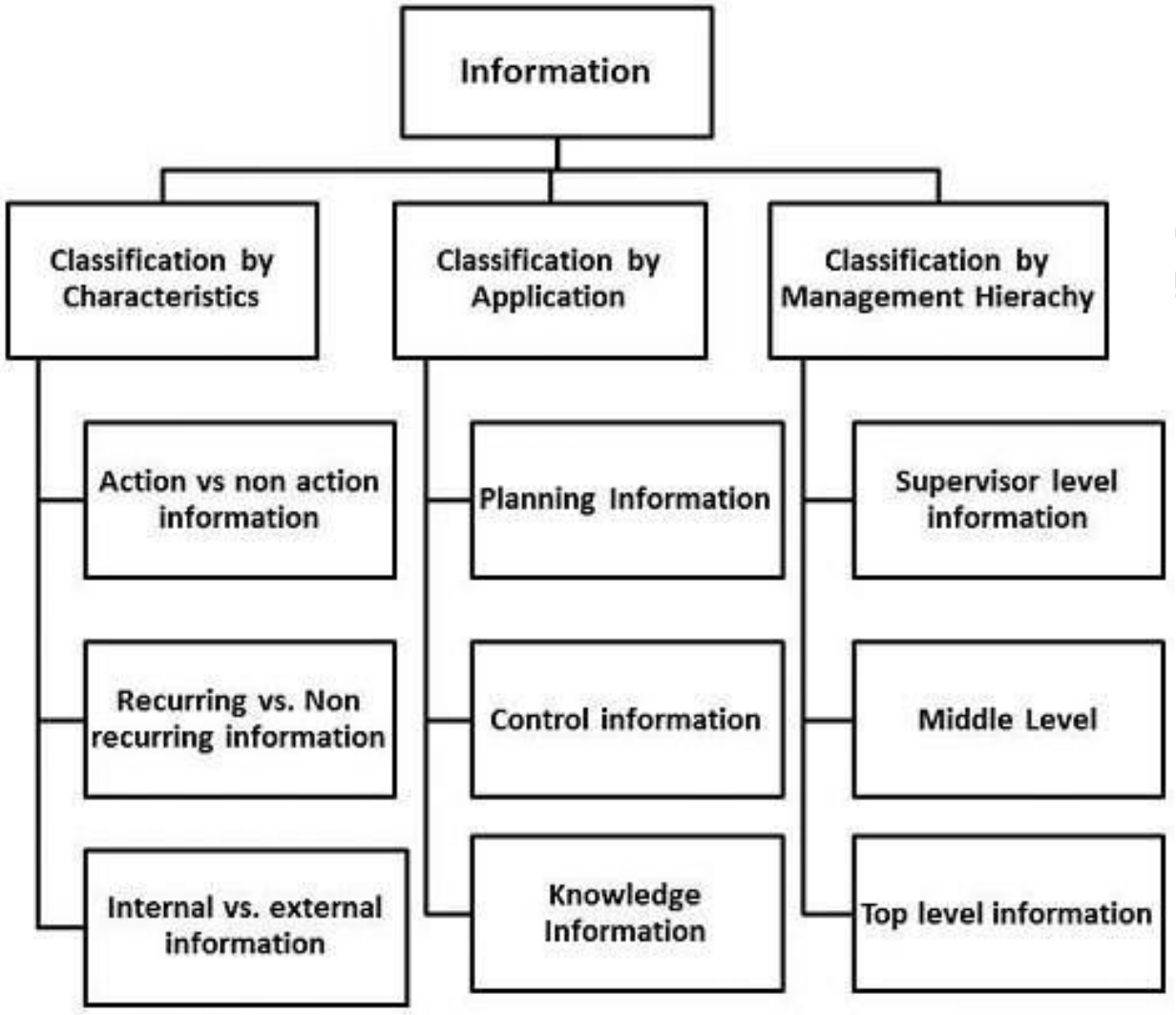
2. **Design Stage:** Various alternatives are developed and evaluated.
3. **Choice Stage:** A course of action is selected and feedback is collected on the implementation decision.

INFORMATION

Information is processed data and takes the meaning as a tangible or intangible entity that reduces uncertainty and triggers action.

Data → Processing → Information

CLASSIFICATION OF INFORMATION



Classification by Characteristic

Information used in business for decision-making is generally categorized into three types:

Strategic Information: Strategic information deals with the objectives of a business with long term policy decisions and checks whether these objectives are met up to their level or not. For example, acquiring a new plant, a new product, diversification of business etc, comes under strategic information.

Tactical Information: Tactical information deals with the information needed to control over business resources, like budgeting, quality control, service level, inventory level, productivity level etc.

Operational Information: Operational information deals with plant/business level information and is used to handle proper conduction of specific operational tasks as

planned/intended. Various operator specific, machine specific and shift specific jobs for quality control checks comes under this category.

Classification by Application

In terms of applications, information can be categorized as:

Planning Information: These are the information used in business organizations maintaining standard norms and specifications. Everything is planned here. This information is used in strategic, tactical, and operation planning of any activity. Examples of such information are time standards, design standards.

Control Information: This information is required for specific activities performed by the system in order to attain their objectives. This information might be formal or informal. It is used for controlling attainment, nature and utilization of important processes in a system. When this information did get any deviation from the established standards, the system should develop a decision or an action leading to control the information related to their objectives.

Knowledge Information: Knowledge is defined as "information about information". Knowledge information is acquired through experience and learning, and collected from archival data and research studies.

Organizational Information: Organizational information deals with an organization's environment, where organizational objectives are met. Karl Weick's Organizational Information Theory emphasizes that an organization reduces its equivocality or uncertainty by collecting, managing and using these information carefully. This information is used by everybody in the organization; examples of such information are employee and payroll information.

Functional/Operational Information: This is operation specific information where the organization assists to perform its functions of day-day transactions. Mainly holds technical work For example, daily schedules in a manufacturing plant that refers to the detailed assignment of jobs to machines or machines to operators. In a service oriented business, it would be the duty roster of various personnel. This information is mostly internal to the organization.

Database Information: Database information as we know that it is a collection of related data that is stored, retrieved and managed to form databases. It stores large quantities of information that has multiple usage and application. For example, material specification or supplier information is stored for multiple users. It is a type of software program.

VALUE OF INFORMATION

Normative Value of Information

This information or knowledge is represented by an a priori assignment of probability of occurrence to the event and hence a calculated payoff. The a priori probability might be objective or subjective as the case may be and with the knowledge of additional information the probabilities are modified resulting in a change in the expected payoffs. This approach is however, only good for theoretical discussions as its practical applicability is poor. The problem for such cases has to be highly structured, which is rarely the case in management.

Subjective Value of Information

It is the subject view of the information available. It is the subjective perception or impression of the information. This subjective value approach varies widely with individuals. In the subjective valuation of information, no probabilities are calculated. Subjective value of information is the person's (receiver's) comprehensive impression about the information content.

CHANNEL INFORMATION SYSTEM (CIS)

- The orderly flow if pertinent operational data, both internally and between channel members, for use as the basis for decision making
- Information about the channel members, channel flow of goods / services, transactions etc. all are Channel Information
- The purpose is to collect and analyze data about the operations of channels

Elements of CIS

- Market information
- Competition tracking

- Distributor profiles and database
- Primary sales
- Secondary sales
- Pricing trends
- Promotions history
- Promotions evaluation
- Inventory control
- Distribution costs

OTHER IMPORTANT TOPICS TO LEARN

Tools / Techniques For Analyzing Large Databases

- For very large databases and systems, special capabilities and tools are required for analyzing large quantities of data and for accessing data from multiple systems

  - **Data warehousing**
  - **Multidimensional data analysis**
  - **Data mining**
  - **Utilizing Web interfaces to databases**

DATA WAREHOUSING

Data warehousing is a collection of decision support technologies, aimed at enabling the knowledge worker (executive, manager, and analyst) to make better and faster decisions.

Data Warehouse

A data warehouse is a "subject-oriented, integrated, time varying, non-volatile collection of data that is used primarily in organizational decision making

The data warehouse supports On-Line Analytical Processing (OLAP), the functional and performance requirements of which are quite different from those of the On-Line Transaction Processing (OLTP) applications traditionally supported by the operational databases.

Characteristics of Data warehouse

- **Subject Oriented**: Data that gives information about a particular subject instead of about a company's ongoing operations.
- **Integrated**: Data that is gathered into the data warehouse from a variety of sources and merged into a coherent whole.
- **Time-variant**: All data in the data warehouse is identified with a particular time period.
- **Non-volatile**: Data is stable in a data warehouse. More data is added but data is never removed. This enables management to gain a consistent picture of the business

Functions of data warehouse

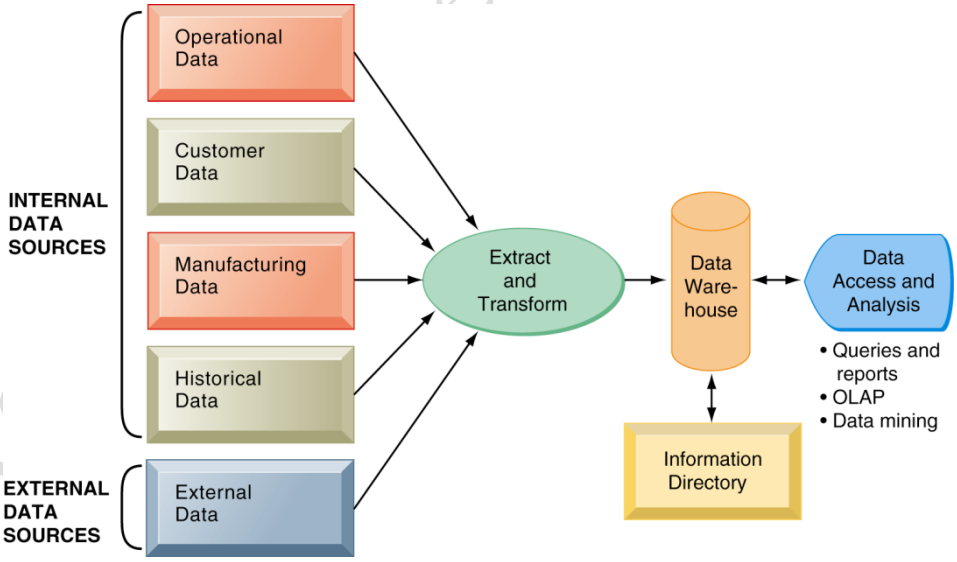
- Stores current and historical data from many core operational transaction systems
- Consolidates and standardizes information for use across enterprise, but data cannot be altered
- Data warehouse system will provide query, analysis, and reporting tools

OLTP vs Data warehouse

- **OLTP**
  - Application Oriented
  - Used to run business
  - Detailed data
  - Current up to date
  - Isolated Data
  - Clerical User
  - Few Records accessed at a time (tens)
  - Read/Update Access
  - No data redundancy
  - Database Size 100MB -100 GB
  - Transaction throughput is the performance metric
  - Thousands of users
  - Managed in entirety

- **Warehouse (DSS)**
  - Subject Oriented
  - Used to analyze business
  - Summarized and refined
  - Snapshot data
  - Integrated Data
  - Knowledge User (Manager)
  - Large volumes accessed at a time (millions)
  - Mostly Read (Batch Update)
  - Redundancy present
  - Database Size 100 GB - few terabytes
  - Query throughput is the performance metric
  - Hundreds of users
  - Managed by subsets

Components of Data warehouse



- The data warehouse extracts current and historical data from multiple operational systems inside the organization.
- These data are combined with data from external sources and reorganized into a central database designed for management reporting and analysis.

- The information directory provides users with information about the data available in the warehouse.

Strategic uses of data warehousing

Industry	Functional areas of use	Strategic use
Airline	Operations; marketing	Crew assignment, aircraft development, mix of fares, analysis of route profitability, frequent flyer program promotions
Banking	Product development; Operations; marketing	Customer service, trend analysis, product and service promotions, reduction of IS expenses
Credit card	Product development; marketing	Customer service, new information service, fraud detection
Health care	Operations	Reduction of operational expenses
Investment and Insurance	Product development; Operations; marketing	Risk management, market movements analysis, customer tendencies analysis, portfolio management
Retail chain	Distribution; marketing	Trend analysis, buying pattern analysis, pricing policy, inventory control, sales promotions, optimal distribution channel
Telecommunications	Product development; Operations; marketing	New product and service promotions, reduction of IS budget, profitability analysis
Personal care	Distribution; marketing	Distribution decisions, product promotions, sales decisions, pricing policy
Public sector	Operations	Intelligence gathering

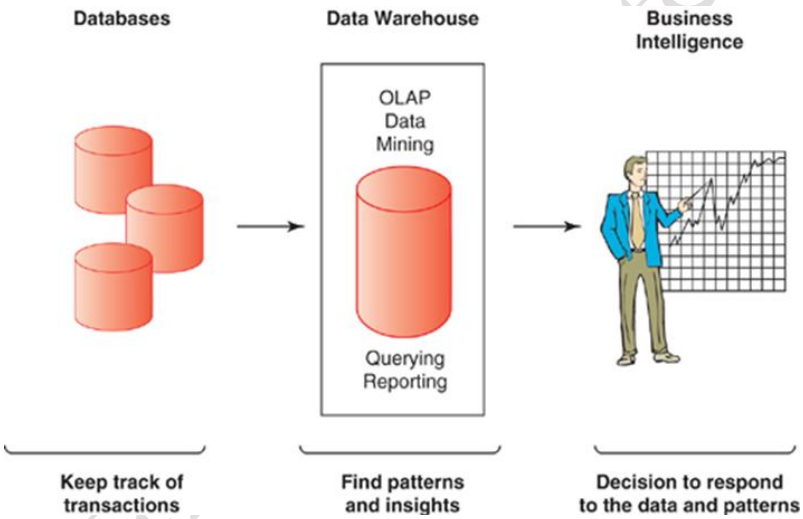
Disadvantages of data warehouses

- Data warehouses are not the optimal environment for unstructured data.
- Because data must be extracted, transformed and loaded into the warehouse, there is an element of latency in data warehouse data.
- Over their life, data warehouses can have high costs. Maintenance costs are high.
- Data warehouses can get outdated relatively quickly. There is a cost of delivering suboptimal information to the organization.
- There is often a fine line between data warehouses and operational systems. Duplicate, expensive functionality may be developed. Or, functionality may be developed in the data warehouse that, in retrospect, should have been developed in the operational systems and vice versa.

Business Intelligence

- One ultimate use of the data gathered and processed in the data life cycle is for business intelligence.
- Business intelligence generally involves the creation or use of a data warehouse and/or data mart for storage of data, and the use of front-end analytical tools such as Oracle's Sales Analyzer and Financial Analyzer or Micro Strategy's Web.
- Such tools can be employed by end users to access data, ask queries, request ad hoc (special) reports, examine scenarios, create CRM activities, devise pricing strategies, and much more.

- Tools for consolidating, analyzing, and providing access to vast amounts of data to help users make better business decisions
- Principle tools include:
  - Software for database query and reporting
  - Online analytical processing (OLAP)
  - Data mining



A series of analytical tools works with data stored in databases to find patterns and insights for helping managers and employees make better decisions to improve organizational performance.

Application of Business Intelligence

- Financial modeling
- Budgeting

- Resource allocation
- Competitive intelligence.

Online analytical processing (OLAP)

- Supports multidimensional data analysis
- Enables viewing data using multiple dimensions
- Each aspect of information (product, pricing, cost, region, time period) is different dimension
  - E.g. how many washers sold in East in June
- OLAP enables rapid, online answers to ad hoc queries

On-Line Analytical Processing (OLTP) Vs **On-Line Transaction Processing (OLAP)**

	OLTP	OLAP
Users Function	Clerk, IT professional Day to day operations	Knowledge worker Decision support
DB design	Application-oriented	Subject-oriented
Data	Current, up-to-date Detailed, flat relational Isolated	Historical, Summarized, multidimensional Integrated, consolidated
Usage	Repetitive	Ad-hoc
Access	Read/write, Index/hash on prim. Key	Lots of scans
Unit of work	Short, simple transaction	Complex query

DATA MINING

- **Data Mining** is the process of extracting information from the company's various databases and re-organizing it for purposes other than what the databases were originally intended for.
- It provides a means of extracting previously unknown, predictive information from the base of accessible data in data warehouses.
- Data mining process is different for different organizations depending upon the nature of the data and organization.
- Data mining tools use sophisticated, automated algorithms to discover hidden patterns, correlations, and relationships among organizational data.

- Data mining tools are used to predict future trends and behaviors, allowing businesses to make proactive, knowledge driven decisions.
- For ex: for targeted marketing, data mining can use data on past promotional mailings to identify the targets most likely to maximize the return on the company's investment in future mailings.

Types of information obtainable from data mining

- **Associations:** Occurrences linked to single event
- **Sequences:** Events linked over time
- **Classification:** Recognizes patterns that describe group to which item belongs
- **Clustering:** Similar to classification when no groups have been defined; finds groupings within data
- **Forecasting:** Uses series of existing values to forecast what other values will be

Data Mining - A KDD process

Knowledge Discovery in Databases (KDD) is the nontrivial process of identifying or Extracting non-trivial, implicit, valid, novel, potentially useful, and ultimately understandable patterns in data

Steps in KDD process

1. **Data cleaning**
   To remove noise and inconsistent data
2. **Data integration**
   To integrate (compile) multiple data sources
3. **Data selection**
   Data relevant to analysis is selected
4. **Data transformation**
   Summary normalization aggregation operations are performed (convert data into two dimension form) and consolidate the data
5. **Data mining**
   Intelligent methods are applied to the data to discover knowledge or patterns
6. **Pattern evaluation**
   Evaluation of the interesting patterns by thresholding, visualization, transformation, removing redundant patterns
7. **Knowledge Discovery**
   Visualization and presentation methods are used to present the mined knowledge to the user.

Data mining functionalities

- **Multidimensional concept description: Characterization and discrimination**
  Generalize, summarize, and contrast data characteristics, e.g., dry vs. wet regions
- **Frequent patterns, association,** correlation vs. causality
- **Classification and prediction**
  Construct models (functions) that describe and distinguish classes or concepts for future prediction
  E.g., classify countries based on (climate), or classify cars based on (gas mileage)
  Predict some unknown or missing numerical values
- **Outlier analysis**
  - Outlier: a data object that does not comply with the general behavior of the data
    It can be considered as noise or exception but is quite useful in fraud detection, rare events analysis
- **Trend and evolution analysis**
  - Trend and deviation: regression analysis
  - Sequential pattern mining, periodicity analysis
  - Similarity-based analysis
- **Other pattern-directed or statistical analyses**

Applications of Data mining

APPLICATION	DESCRIPTION
Market segmentation	Identifies the common characteristics of customers who buys the same products from the company
Customer churn	Predicts which customers are likely to leave your company and go to a competitor
Fraud detection	Identifies which transactions are most likely to be fraudulent
Direct marketing	Identifies which prospects should be included in a mailing list to obtain the highest response rate
Market based analysis	Understands what products or services are commonly purchased together
Trend analysis	Reveals the difference between a typical customer this month versus last month
Science	Simulates nuclear explosions; visualizes quantum physics
Entertainment	Models customer flows in theme parks; analyzes safety of amusement parks rides
Insurance and health care	Predicts which customers will buy new policies; identifies behavior patterns that increase insurance risk; spots fraudulent claims
Manufacturing	Optimizes product design, balancing manufacturability and safety; improves shop-floor scheduling and machine utilization
Medicine	Ranks successful therapies for different illnesses; predicts drug efficacy; discovers new drugs and treatments
Oil and gas	Analyzes seismic data for signs of underground deposits ; prioritizes drilling locations; simulates underground flows to improve recovery
Retailing	Discerns buying-behavior patterns; predicts how customers will respond to marketing campaigns

Data mining softwares

1. Angoss software
2. Infor CRM Epiphany
3. Portrait Software
4. SAS
5. SPSS
6. ThinkAnalytics
7. Unica