

**EDUSAT LEARNING RESOURCE MATERIAL**

**ON**

# **MANAGEMENT INFORMATION SYSTEMS**

**5<sup>th</sup> Semester**

**Computer Science Engineering**

**According to S. C. T. E & V. T. Syllabus for Diploma Students**

Prepared By:-

**SRI RAMESH CHANDRA SAHOO, Sr. Lect. CSE/IT**  
U.C.P.ENGG.SCHOOL, BERHAMPUR

**SMT NAYANA PATEL, PTGF CSE/IT**  
U.C.P.ENGG.SCHOOL, BERHAMPUR

**MISS SASMITA MISRA, PTGF CSE/IT**  
U.C.P.ENGG.SCHOOL, BERHAMPUR

---

**Copy Right DTE&T, Odisha**

# CONTENTS

<b>CHAPTER-1 .....</b>	<b>7</b>
<b>MANAGEMENT INFORMATION SYSTEMS: AN OVERVIEW .....</b>	<b>7</b>
1.1. INTRODUCTION .....	7
1.2. MANAGEMENT INFORMATION SYSEYEM .....	7
1.2.1. Management.....	7
1.2.2. Information .....	8
1.2.3. System.....	9
1.3. DEFINITIONS OF MIS. ....	9
1.4. FRAMEWORK FOR MIS ORGANISATION AND MANAGEMENT TRIANGLE.....	10
1.4.1. Levels of Management.....	10
1.5. INFORMATION NEEDS AND ITS ECONOMICS .....	10
1.5.1. Information Classification .....	11
1.6. SYSTEMS APPROACH .....	11
1.6.1. Classification of systems.....	12
1.6.2. System life cycle.....	13
1.7. MEANING AND OBJECTIVES OF MIS .....	13
1.7.1. Categories of MIS: .....	14
1.7.2. MIS and Organisation Structure: .....	14
1.7.3. Classification of MIS .....	15
1.7.4. Implementation of MIS.....	16
1.8. DISADVANTAGES OF INFORMATION SYSTEM.....	17
1.9. APPROACHES OF MIS DEVELOPMENT.....	17
1.10. CONSTRAINTS IN DEVELOPING AN MIS.....	18
1.11. MIS AND USE OF COMPUTER .....	18
1.12. LIMITATIONS OF MIS.....	19
1.13. COMPUTER BASED INFORMATION SYSTEMS.....	19
<b>CHAPTER-2 .....</b>	<b>21</b>
<b>INFORMATION SYSTEMS FOR DECISION MAKING .....</b>	<b>21</b>
2.1. INTRODUCTION .....	21
2.2. TRANSACTION PROCESSING SYSTEM.....	21
2.3. MANAGEMENT INFORMATION SYSTEMS.....	23
2.3.1. Decision Making In MIS .....	23
2.4. INTELLIGENT SUPPORT SYSTEMS .....	25
2.4.1. Decision support system: .....	25
2.4.2. Executive information systems: .....	25
2.4.3. Artificial intelligence and Expert systems: .....	26
2.5. OFFICE AUTOMATION SYSTEM.....	26
<b>CHAPTER-3 .....</b>	<b>29</b>
<b>COMPUTER HARDWARE FOR INFORMATION SYSTEMS.....</b>	<b>29</b>
3.1. INTRODUCTION .....	29
3.2. BASICS OF DATA REPRESENTATION .....	29
3.3. TYPES OF COMPUTERS .....	30
3.4. BASIC COMPONENTS OF COMPUTER SYSTEMS.....	31
3.5. FACTORS TO BUY A PC:.....	35
<b>CHAPTER-4 .....</b>	<b>36</b>
<b>COMPUTER SOFTWARE FOR INFORMATION SYSTEMS .....</b>	<b>36</b>

4.1. INTRODUCTION .....	36
4.2. PROGRAMMING LANGUAGES.....	36
4.2.1. Object oriented programming.....	38
4.2.2. Visual Programming:.....	39
4.3. CLASSIFICATION OF SOFTWARE: .....	39
4.3.1. System Software .....	39
4.3.2. Application Software: .....	40
4.4. ROLE OF SOFTWARE IN PROBLEM SOLVING.....	41
4.5. CRITERIA FOR INVESTMENT IN HARDWARE AND SOFTWARE .....	41
<b>CHAPTER-5 .....</b>	<b>43</b>
<b>DATA COMMUNICATIONS SYSTEM .....</b>	<b>43</b>
5.1. INTRODUCTION .....	43
5.2. TELECOMMUNICATIONS SYSTEM.....	43
5.2.1. Telecommunications Channels .....	43
5.2.2. Telecommunications Media.....	44
5.3. DATA COMMUNICATIONS HARDWARE .....	44
5.4. DATA COMMUNICATIONS SOFTWARE.....	45
5.5. COMMUNICATION NETWORKS .....	45
5.5.1. Private Branch Exchanges (PBXs) .....	46
5.5.2. Integrated Services Digital Networks (ISDNs): .....	46
5.5.3. Local Area Networks (LANS).....	47
5.5.4. Wide Area Networks (WANS).....	47
5.5.5. Value Added Networks (VANS) .....	48
5.6. DISTRIBUTED SYSTEMS .....	48
5.7. TOPOLOGY OF COMPUTER NETWORK.....	49
5.8. PROTOCOLS AND NETWORK ARCHITECTURE .....	51
5.9. OPEN SYSTEM INTERCONNECTION (OSI) .....	52
5.10. NETWORK MANAGEMENT:.....	53
<b>CHAPTER-6 .....</b>	<b>55</b>
<b>DATABASE MANAGEMENT TECHNOLOGY .....</b>	<b>55</b>
6.1. INTRODUCTION .....	55
6.2. DATA AND INFORMATION.....	55
6.3. DATA HIERARCHY .....	55
6.4. METHODS FOR ORGANISING DATA IN FILES .....	56
6.4.1. Sequential File Organisation.....	57
6.4.2. Direct File Organisation.....	57
6.4.3. Indexed-Sequential File Organisation.....	57
6.5. LIMITATIONS OF FILE BASED SYSTEMS .....	58
6.6. DATABASE AND DATABASE MANAGEMENT SYSTEMS .....	58
6.6.1. Advantages of database.....	59
6.6.2. Disadvantage.....	59
6.6.3. Data management.....	59
6.6.4. Differences between databases and traditional files .....	60
6.6.5. Components of a DBMS.....	60
6.6.6. Database Models.....	61
6.7. OBJECT ORIENTED DATABASE STRUCTURE .....	64
6.8. ERD DIAGRAM .....	65
6.9. FOURTH GENERATION OF PROGRAMMING LANGUAGE.....	67
6.10 RECENT DEVELOPMENT IN DATABASES.....	67
6.10.1 Distributed databases .....	67

6.10.2 Client server architecture .....	68
6.10.3 Object oriented databases. ....	68
6.10.4 Multimedia databases.....	68
6.11. PRINCIPLE OF DATABASE MANAGEMENT .....	68
6.12. THE DATABASE ADMINISTRATOR .....	68
<b>CHAPTER-7 .....</b>	<b>69</b>
<b>CLIENT-SERVER COMPUTING .....</b>	<b>69</b>
7.1. INTRODUCTION .....	69
7.2. DEFINATION OF CLIENT-SERVER COMPUTING.....	69
7.3. COMPONENTS AND FUNCTION OF A CLIENT SERVER SYSTEM .....	69
7.4. DEVELOPMENT OF CLIENT-SERVER SYSTEM .....	71
7.5. CLIENT-SERVER SECURITY .....	72
7.6. CLIENT-SERVER COSTS COMPUTATIONS .....	72
7.7. ADVANTAGES OF CLIENT-SERVER SYSTEM .....	72
7.8. DISADVANTAGES/OBSTACLES OF A CLIENT-SERVER SYSTEM .....	73
<b>CHAPTER-8 .....</b>	<b>74</b>
<b>DECISION SUPPORT SYSTEM .....</b>	<b>74</b>
8.1. INTRODUCTION .....	74
8.2. DEFINATIONS .....	74
8.3. EVOLUTION OF DSS:.....	75
8.4. OBJECTIVES OF DSS.....	76
8.5. CLASSIFICATION OF DSS.....	76
8.6. CHARACTERISTICS OF DECISION SUPPORT SYSTEM (DSS) .....	77
8.7. COMPONENTS OF A DSS .....	77
8.7.1. Database Management System (DBMS) .....	77
8.7.2. Model Management system .....	77
8.7.3. Support Tools.....	78
8.8. FUNCTIONS OF A DSS.....	78
8.9. DEVELOPMENT OF DECISION SUPPORT SYSTEMS.....	79
8.10. GROUP DECISION SUPPORT SYSTEMS.....	80
8.11. EXECUTIVE INFORMAION SYSTEMS.....	80
8.11.1. Characteristics of an EIS.....	80
8.12. SUCCESS CRITERIA FOR DSS/EIS: .....	81
8.13 RELATIONSHIP BETWEEN MIS AND DSS.....	81
8.14 DSS MEASURES OF SUCCESS IN ORGANISATIONS:.....	81
8.15 APPLICATION OF A DSS .....	82
8.16. TPS, MIS, DSS, AND EIS: .....	83
8.17. FUTURE DEVELOPMENT IN DSS .....	83
<b>CHAPTER-9 .....</b>	<b>84</b>
<b>OFFICE INFORMATION SYSTEMS.....</b>	<b>84</b>
9.1. INTRODUCTION .....	84
9.2. OFFICE AUTOMATION.....	84
9.3. OFFICES AND OFFICE SYSTEMS .....	84
9.3.1. Nature of the Office .....	84
9.3.2. Evolution of Office Systems.....	85
9.4. TYPES OF OFFICE AUTOMATION SYSTEMS .....	87
9.4.1. Document Management Systems.....	87
9.4.2. Communication Systems .....	92
9.4.3. Teleconferencing Systems .....	95
9.4.4. Office Support Systems .....	97

9.5. INTEGRATED OFFICE .....	98
<b>CHAPTER-10 .....</b>	<b>99</b>
<b>INFORMATION SYSTEMS IN BUSINESS .....</b>	<b>99</b>
10.1. INTRODUCTION .....	99
10.2. FUNCTIONAL AREAS OF BUSINESS .....	99
10.3. MANUFACTURING INFORMATION SYSTEMS .....	100
10.3.1 Sources of Manufacturing Information.....	102
10.3.2. Advantages of Manufacturing Information System.....	102
10.4. MARKETING INFORMATION SYSTEM.....	103
10.4.1. Input of Marketing Information Systems.....	103
10.4.2. Outputs of marketing information systems.....	104
10.4.3. Advantages of Marketing Information Systems .....	105
10.5. QUALITY INFORMATION SYSTEMS .....	105
10.5.1 Advantages of quality information systems.....	106
10.6. FINANCIAL AND ACCOUNTING INFORMATION SYSTEMS .....	107
10.6.1. Types of financial and accounting information systems.....	108
10.6.2. Integrated Financial and accounting systems .....	108
10.7. RESEARCH AND DEVELOPMENT INFORMATION SYSTEMS .....	109
10.8. HUMAN RESOURCES INFORMATION SYSTEMS .....	110
10.9 GEOGRAPHICAL INFORMATION SYSTEMS .....	111
10.10. CROSS FUNCTIONAL SYSTEMS .....	111
<b>CHAPTER-11 .....</b>	<b>113</b>
<b>SYSTEMS ANALYSIS AND DESIGN .....</b>	<b>113</b>
11.1. INTRODUCTION .....	113
11.2. SYSTEM DEVELOPMENT LIFE CYCLE (SDLC).....	113
11.2.1. Problem Definition.....	113
11.2.2. System Analysis.....	114
11.2.3. System Design and Programming.....	115
11.2.4. System Testing & Implementation .....	116
11.2.5. System Maintenance .....	117
11.3. PROTOTYPING.....	117
11.3.1. Types of Prototypes .....	117
11.4. RAPID APPLICATION DEVELOPMENT (RAD).....	118
11.4.1. Essential ingredients of RAD.....	118
11.5. END USER COMPUTING .....	119
11.5.1. Types of End –User Computing .....	119
11.5.2. Managing End-User Computing .....	119
11.6. SOFTWARE PACKAGES .....	120
11.7. OUTSOURCING.....	120
11.8. COMPARISON OF IS DEVELOPMENT METHODOLOGIES .....	120
11.9. OTHER TOOLS FOR INFORMATION SYSTEMS DEVELOPMENT .....	121
11.10. COMPUTER AIDED S/W ENGINEERING (CASE) .....	121
11.11. CHALLENGES IN DEVELOPING INFORMATION SYSTEMS.....	122
<b>CHAPTER-12 .....</b>	<b>123</b>
<b>STRATEGIC MANAGEMENT INFORMATION SYSTEM .....</b>	<b>123</b>
12.1. INTRODUCTION .....	123
12.2. CHARACTERISTICS OF SMIS.....	124
12.3. STRATEGIC PLANNING FOR MIS .....	124
12.4. DEVELOPMENT OF SMIS.....	125
12.5. MIS STRATEGY IMPLIMENTATION .....	127

12.6. BARRIERS TO DEVELOPMENT OF SMIS.....	127
<b>CHAPTER-13 .....</b>	<b>129</b>
<b>INFORMATION RESOURCES MANAGEMENT .....</b>	<b>129</b>
13.1. INTRODUCTION .....	129
13.2. PRINCIPLE OF IRM.....	129
13.3. IRM OBJECTIVES .....	129
13.4. FUNCTIONAL COMPONENTS OF IRM .....	130
13.5. ORGANISATION OF INFORMATION RESOURCE FUNCTION .....	131
13.6. APPLICATION OF SCARCE INFORMATION SYSTEM RESOURCES.....	131
13.7. MANAGEMENT OF INFORMATION SYSTEM PERSONNEL.....	131
13.8. MANAGEMENT OF END-USER COMPUTING .....	132
13.9. A PROACTIVE CIO STRATEGY .....	132
<b>CHAPTER-14 .....</b>	<b>133</b>
<b>ENTERPRISE RESOURCE PLANNING .....</b>	<b>133</b>
14.1. INTRODUCTION .....	133
14.2. ENTERPRISE MODELLING.....	133
14.3. ROLE OF INFORMATION TECHNOLOGY IN ENTERPRISE MODELING .....	134
14.4. FLOW OF INFORMATION: .....	135
14.5. ROLE OF COMMON/SHARED ENTERPRISE DATABASE .....	135
14.6. SELECTION OF ERP .....	136
14.7. APPLICATION OF POC APPROACH .....	136
14.8. MATERIAL REQUIREMENTS PLANNING .....	137
14.9. MANUFACTURING RESOURCE PLANNING (MRP II) .....	138
14.10. BUSINESS PROCESS RE-ENGINEERING (BPR).....	140
14.11. ERP EMPLEMENTATION METHODOLOGY .....	140
14.12. PRINCIPLE FOR ERP IMPLEMENTATION .....	142
14.13. GUIDELINES FOR ERP IMPLEMENATION .....	142
14.14. CAUSES OF FAILURE IN ERP IMPLEMENTATION .....	143
14.15. SAMPLE LIST OF ERP VENDRS .....	143
14.16. ERP SOFTWARE PACKAGE (SAP).....	144
<b>CHAPTER-15 .....</b>	<b>147</b>
<b>SUPPLY CHAIN MANAGEMENT .....</b>	<b>147</b>
15.1 INTRODUCTION .....	147
15.2 DEFINATION .....	147
15.3. CONCEPT OF SCM.....	147
15.4. SCM PROCESS.....	147
15.5. STEVAN’S MODEL OF SUPPLY CHAIN INTEGRATION .....	148
15.6. GOAL/COMPONENTS OF SCM.....	148
15.7. PERFORMANCE OF SUPPLY CHAIN .....	149
15.8. COMPARISON BETWEEN ERP AND SCM.....	150
15.9. ERP IMPLEMENTATION: A CASE OF DISTORTION OF DEMAND .....	150
15.10. SUPPLY CHAIN SOLUTION VS ERP VENDORS.....	151
15.11. BENEFITS OF SCM .....	151
15.12. DISADVANTAGES OF SCM .....	152
<b>CHAPTER-16 .....</b>	<b>153</b>
<b>APPLICATIONS OF INFORMATION TECHNOLOGY IN BUSINESS .....</b>	<b>153</b>
16.1 INTRODUCTION .....	153
16.2. E-COMMERCE (EC).....	153
16.3. COMMERCE OVER THE INTERNET .....	154
16.3.1. EDI over the internet.....	154

16.3.2. Web based commerce .....	154
16.3.3. Security issues in electronic transactions.....	155
16.4. ELECTRONIC CASH OVER THE INTERNET .....	156
16.4.1. Elements in electronic Cash Flow.....	156
16.5. INTERNET SECURITY .....	157
16.5.1. Guidelines for Cryptography policy .....	157
16.6. ELECTRONIC BUSINEES (E-BUSINEES) .....	158
16.6.1. Opportunities.....	158
16.6.2. Benefits .....	158
16.6.3. E-business strategy.....	158
16.7. APPLICATIONS OF E-COMMERCE IN INDIA.....	159
16.8. SUCCESSFUL E-COMMERCE .....	159
16.9. MOBILE COMMERCE .....	159
16.10. E-GOVERNANCE .....	160
16.10.1. Models of E-governance .....	160
<b>REVIEW QUESTIONS .....</b>	<b>161</b>
<b>SELECTED REFERENCES .....</b>	<b>166</b>

# CHAPTER-1

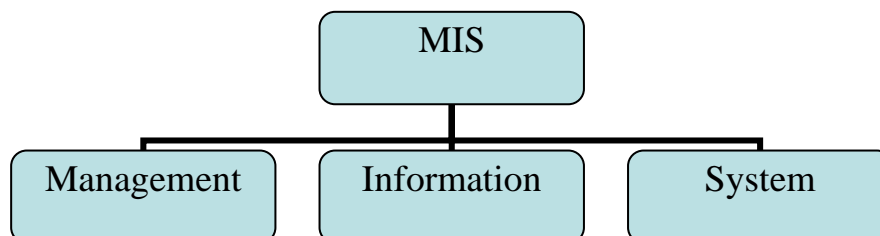
## MANAGEMENT INFORMATION SYSTEMS: AN OVERVIEW

### 1.1. INTRODUCTION

- Today the need for updated information has become inevitable to arrive at an effective decision in all walks of life. Whether it is industry, commerce, defence, banking, education, economics or politics, information is needed everywhere.
- Information is live as it is required to be updated all the time and is renewable.
- The exponential growth of information makes it necessary that information is collected, stored and retrieved in various fields when needed.
- For example
  - (a) In setting of a new industry, information regarding the choice of technology, skill, money and material becomes an important requirement for its growth and smooth functioning.
  - (b) In a competitive market, before deciding about the price of an item, the producer needs information about the pricing policy of the competitors, specially of competitive products, sales techniques etc.

### 1.2. MANAGEMENT INFORMATION SYSTEM

The MIS is an integrated man machine system that provides information to support the planning and control functions of managers in an organisation.



#### 1.2.1. Management

- Management has been viewed as be function, a process, a profession and a class of people. It refers to the kind of task and activities that are perform by managers. The specific nature of the activities is determined by such managerial functions as planning, organising, directing, leadership and controlling.
1. **Planning:** It is the process of deciding in advance the courses of action to be followed and when and how to undertake these. Its objectives in the best possible manner and for anticipating future opportunities and problems.



2. **Organising:** It is formal grouping of people and activities to facilitate achievement of the firm's objectives. It is need for assigning responsibilities, jobs and hierarchy among personnel.
3. **Controlling:** It is the checking the progress of plans and correcting any deviations that may occur along the way.
4. **Directing:** It is the process of activating the plans, structure and group efforts desired direction. It is needed for implementation of plans by providing desired leadership motivation and proper communication.

➤ **The management can be group into 3 hierarchical levels –**

- Top or Strategic management
- Middle or Tactical management
- Junior or Operational management

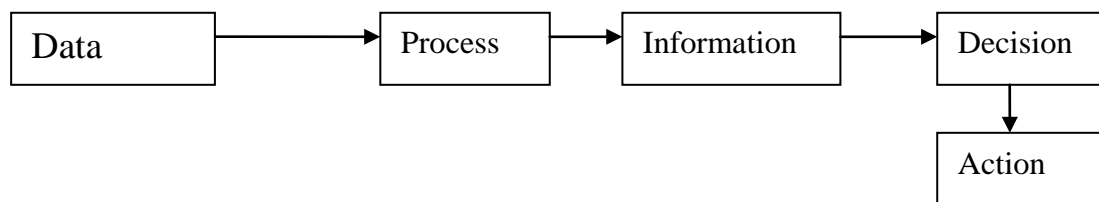
**Top Management:** - It is establishes the policies, plans, objectives and budget framework under which various departments will operate of the organisation.

**Middle Management:** - It has the responsibility of implementing the policies and overall plans of the top management.

**Junior Management:**-It has the responsibility of implementing day to day operations and decisions of the middle management to produce goods and services to meet the revenue, profit and other goals.

### 1.2.2. Information

- Information is the result or product of processing data. Information can be defined as the data which is organised and presented at a time and place so that the decision-maker may take necessary act.

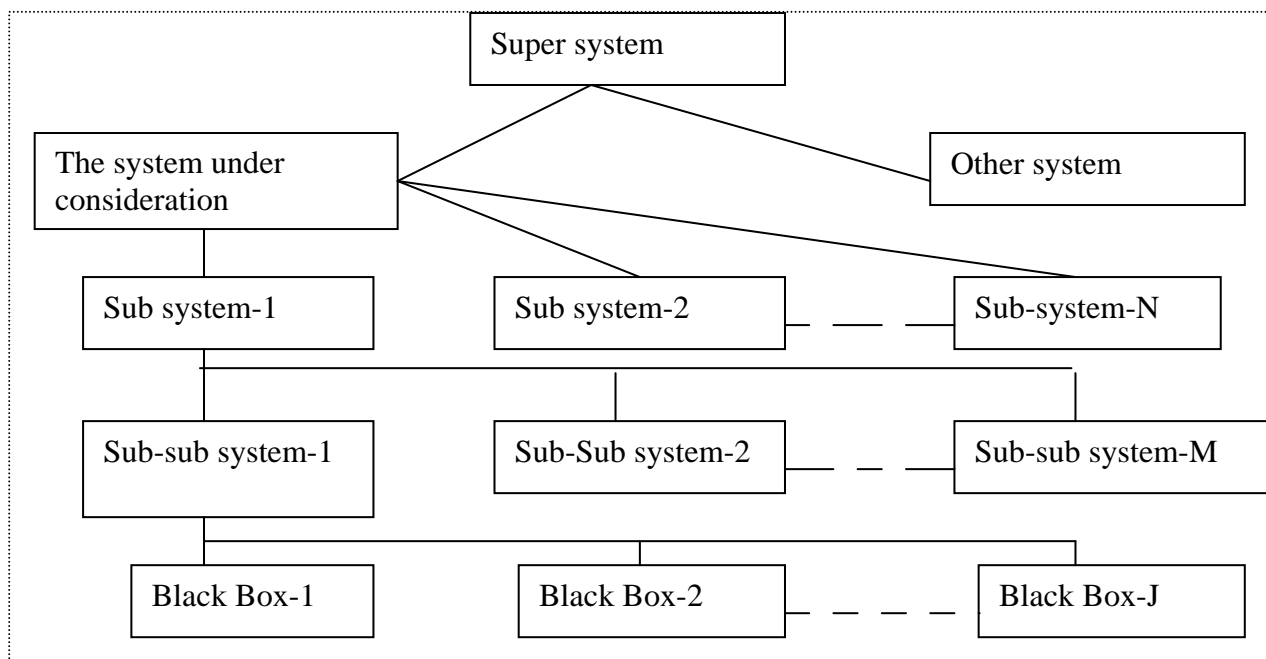


**Fig: Conversion of Data into Decision**

- Information consists of data that has been retrieved, processed or otherwise used, for informative or inferential purposes, arguments or as a basis for forecasting.
- For example, some supporting documents, ledgers and so on, which comprise source material for profit and loss statements may be used by the decision maker for profit planning and control.

### 1.2.3. System

- A system is a group of elements or components joined together to fulfil certain functions.
- A system is made up of sub-system. The systems are either natural or man-made.
- A sub-system which may be composed of further sub-systems. A subsystem itself is part of a super system.
- The given example is that of an industrial (or factory) system. It has various subsystems such as production subsystem, marketing sub-system, personnel sub-system and financial sub-system.
- These sub systems in turn are composed of further subsystem.
- For example a production subsystem could consist of sub-sub-system of production control, material control, quality control etc.
- The material sub-sub-system can be further broken down into 'black boxes' such as purchasing, stores, transportation, inspection etc.
- This industrial system is a part of the large economic system of the country which may be called as the super system.
- This relationship is shown in fig



**Fig: System and its Components**

### 1.3. DEFINITIONS OF MIS.

1. According to Schwartz, 'MIS is a system of people, equipment, procedure, documents and communication that collects, validates, operates on transformers, stores, retrieves and present data for use in planning, budgeting, accounting, controlling and other management process'.
2. According to Jerome Kanter, 'MIS is a system that aids management in making, carrying out and controlling decisions'.

3. According to Davis and Olson, 'MIS is an integrated user machine system designed for providing information to support operational control, management control and decision making functions in an organisation. The information systems make use of resources such as hardware, software, man, procedures as well as suppliers'.

## 1.4. FRAMEWORK FOR MIS ORGANISATION AND MANAGEMENT TRIANGLE

Robert Anthony in 1965 suggested that the area of management planning and control can be divided into 3 categories. These are:

1. Strategic planning.
  2. Operational control.
  3. Management control.
- ❖ **Strategic planning:** It develops the strategy for deciding objectives of the organisation and introducing changes in those objectives, formulating policies to govern procurement, use and disposition of those resources.
  - ❖ **Management control:** It is needed by managers of a various departments to measure the performance, decide on control action, formulate new decision rules and allocate resources.
  - ❖ **Operational control:** It is the processes of operational activities are carried out to achieve optimum use of resources. It makes use of pre-established procedures and decision rules.

### 1.4.1. Levels of Management

Each organisation is made up of several levels. These could be classified into three categories: top, middle and junior (TMJ) levels.

- ✓ The top management performs strategic planning and the other two levels provide support in the form of processed information.
- ✓ The middle management level performs tactical planning and control, and needs information to discharge these managerial functions.
- ✓ The junior level is involved in day to day operational control and needs information for its working.

## 1.5. INFORMATION NEEDS AND ITS ECONOMICS

The availability of information to management at various levels has improved due to three reasons. These are

1. **Development of telecommunications:** The information flow has been accelerated with developments in communication technology like radio telephony, microwave communication, laser communication and satellite communication.
2. **Processing of data with computer:** The accessibility of information has been considerably improved as a computer can readily scan the available stored data to provide the required information.
3. **Video technology:** Video technology permits the recording of activities on video cassettes and video discs.

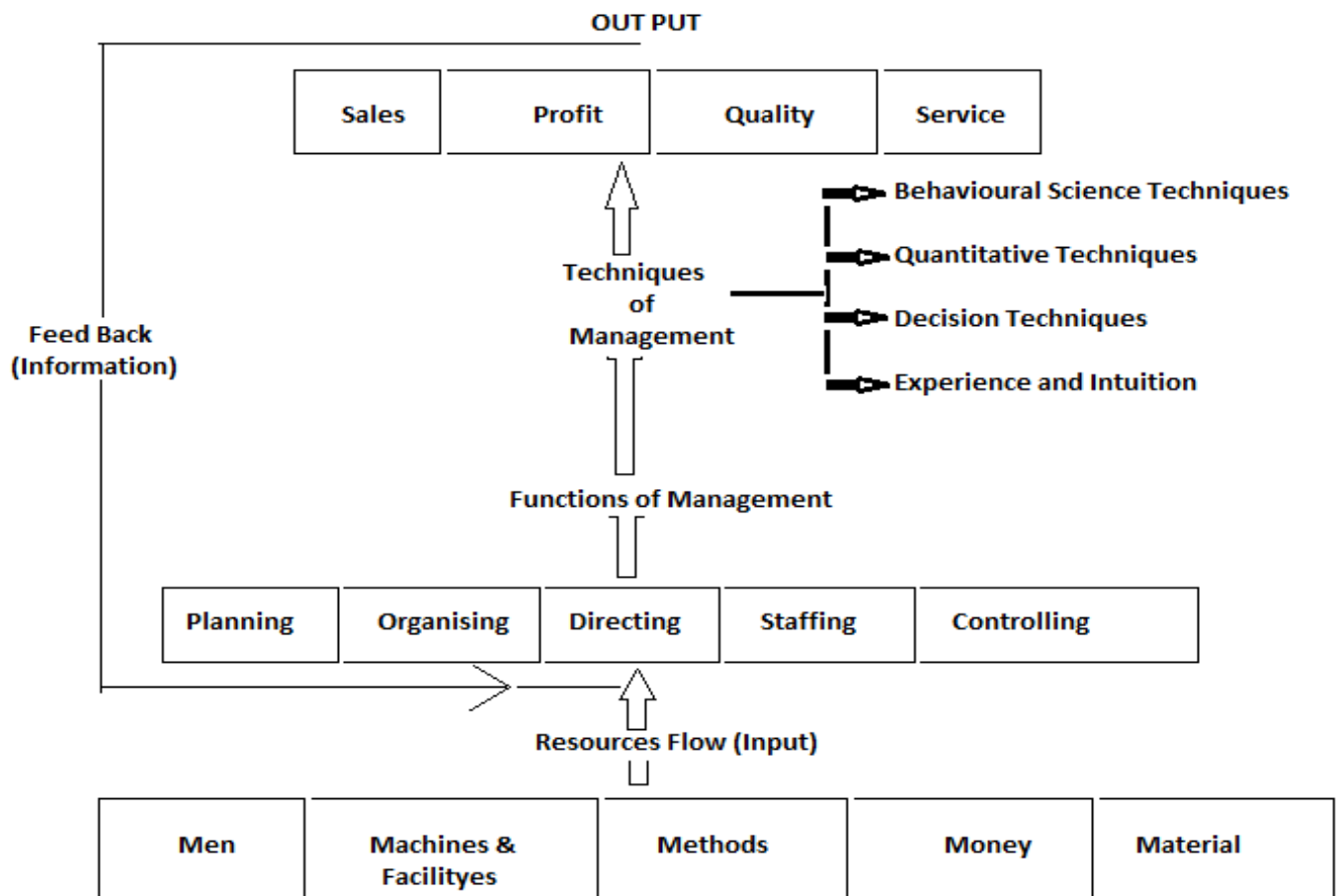
### 1.5.1. Information Classification

The information obtained and used in the organisations can be classified into five categories:

1. **Action vs. non-action information:** The information lying unnoticed is called non action information but the same information when processed and used in some context by the recipient is called action information.
2. **Recurring vs. non recurring information:** Information which is generated at regular intervals of time is called recurring information. A particular type of information which is arrived at through some special kind of study and which helps in management decision is called non recurring information.
3. **Documentary vs. non documentary information:** Information which is available in some document form that is either in some written form or on microfilms, magnetic tapes, floppy discs etc is called documentary information. All other information is categorised as non documentary
4. **Internal vs. external information:** The distinction is obvious. Managers at different hierarchies in the organisation require different combinations of internal and external information.
5. **Historical information vs. future projections:** Here again the distinction is obvious because historical information would be futile unless it can be used for future projection.

### 1.6. SYSTEMS APPROACH

- The system approach to a business organization implies a wholistic approach to the study of inter-relationships of sub-systems of an organization in view of the objectives set by the organisation.
- Thus, this requires an integrated approach which could reduce the conflict among different sub-systems and modify the objectives of these sub-systems in order to arrive at an optimum solution to the problems which may arise in the achievement of the main objectives or in the working of the whole system.
- A systems view of business is shown in fig.



**Business Organisation - A System**

### 1.6.1. Classification of systems

The various types of systems are:

#### **Conceptual and empirical systems:**

- The conceptual system is concerned with theoretical structures which may or may not have any counterpart in the real world. Examples of such systems are economic theory, organization theory, general system of relativity etc.
- Empirical systems are concrete operational systems made up of people, materials, machines, energy, and other physical things. Other systems such as electrical, thermal and chemical are also fall into this category.

#### **1. Natural and man-made systems:**

The examples of natural systems are: human body, solar system, etc.

Examples of man-made systems are: Transportation system, communication system, education system, business organisation etc.

#### **2. Social system:**

A system made up of people may be taken as a social system, such as business organisations, government agencies, political parties, social clubs, professional societies etc.

#### **3. Man-machine system:**

Most empirical systems fall into the category of man-machine systems. One of the examples of this system is aeroplane.

#### **4. Open and closed systems:**

- An open system continually interacts with its environment. This type of system can adapt to changing internal and environmental conditions. Every social and business organization is open because it reacts with its unpredictable environment
- A closed systems one of that does not interact with its environment. This system does not change or if it does then a barrier exists between the system and the environment to prevent the system from being affected.

### **1.6.2. System life cycle**

A management information system business has the following four phases in its life cycle:

#### **1. Study phase:**

This phase is concerned with

1. Identification of the problems
2. Study of the present system and its effectiveness
3. Identification and evaluation of various alternative courses of action
4. Selection of the most appropriate course of action as per the objective.

#### **2. Design phase:**

This phase is concerned with

1. Identification of the function to be performed
2. Study of the input/output and life cycle design
3. Defining basic parameters of system design.

#### **3. Development phase:**

At this stage, the decision about the selection and use of hardware and software is taken.

#### **4. Implementation phase**

The system designed is given practical shape and is adopted for use.

### **1.7. MEANING AND OBJECTIVES OF MIS**

#### **➤ Meaning**

- ✓ MIS is an integrated man-machine system which collects, maintains, correlates and selectively displays information in the proper time frame consistently, to meet the specific needs of various levels of management in order that decisions could be made and action taken for fulfilling the objectives of an organisation.
- ✓ In other words it is a system which:
  - i. Provides information to support managerial function. (Planning, control, organising, operating)
  - ii. Collects information systematically and routinely in accordance with a well defined set of rules.
  - iii. Includes files, hardware, software and operations research models of processing, storing, retrieving and transmitting information to the users.

#### **➤ Objectives**

1. **Facilitate:** The decision making process by furnishing information in the proper time frame.
2. **Provide:** It requisite information at each level of management to carry out their functions.
3. **Help:** In highlighting the critical factors to the closely monitored for success
4. **Support:** Support decision making in both structured and unstructured problem environments.
5. **Provide:** Provide a system of people, computers, and procedures, interactive query facilities documents for collecting, storing, retrieving and transmitting information to the users.

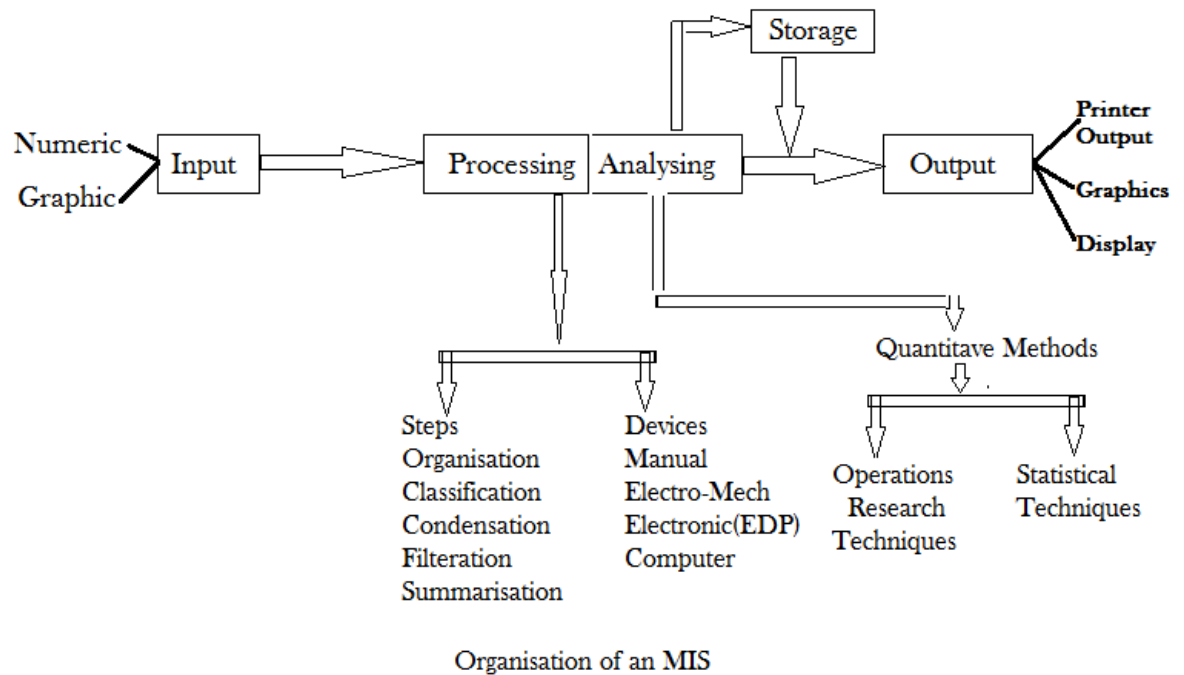
### 1.7.1. Categories of MIS:

The MIS can be subdivided into following four categories:

1. **Transaction processing system (TSP):**  
The system designed for processing day to day transaction in an organisation is called TPS. This system deals with collecting and processing a large volume of data which mainly helps junior level management in discharging their responsibilities.
2. **Information providing system (IPS):**  
This system is meant for processing information, making a summary of information, and providing exception reports. The summary reports help in giving at a glance the information available, while exception reports indicate deviations and the reasons for shortfalls in performance.
3. **Decision support system (DSS):**  
It is sometimes described as the next evolutionary step after MIS.  
It helps in improving the analytical capability of the decision maker by creating interactive model of the real life situation.
4. **Programmed decision-making system:**  
It is defined as a plan for the automatic solution of a problem. Programs are simply a string of instruction as to accomplish a job or a task. In this information age the systems for programmed decisions are created so that decisions are made by the system rather than a person.

### 1.7.2. MIS and Organisation Structure:

- Organisation structure and information needs are inseparably linked like the human anatomy and the nervous system.
- The knowledge of organisation structure and proper record of delegating of authority within the organisation are prerequisites of MIS.
- This actually helps in defining authority and responsibility, demarcating decision making and measuring objectives of each sub system.
- The outline of MIS for any organisation is shown in fig



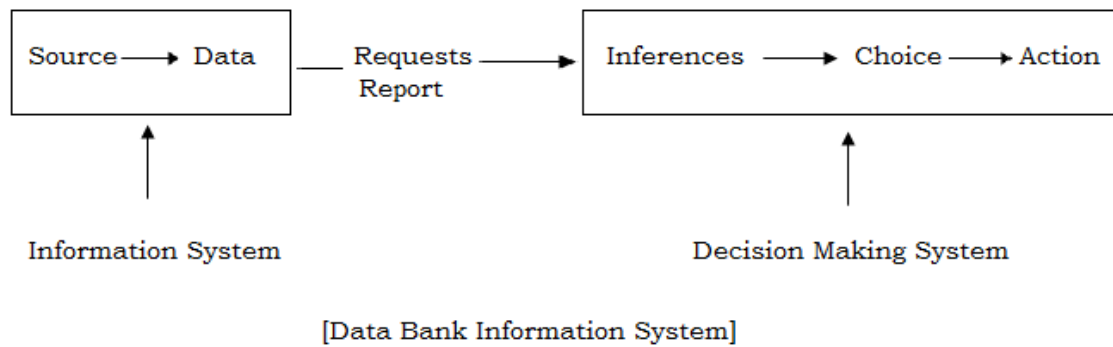
### 1.7.3. Classification of MIS

The MIS can be divided into four categories:

#### 1.Data bank information system:

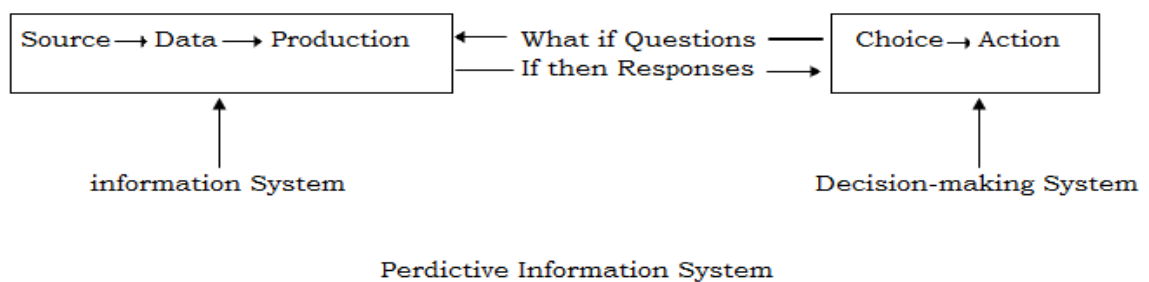
In this system, the link between the information system and the user is assumed to be weak. This type system is more useful for unstructured decisions. The information system collects, classifies and stores data which may be useful to the user. The user makes request for data as per his need and determines the cause and effect in view of the actions and makes judgement as to which outcome is suitable. The data doesn't help the user in making predictions or decisions, however, the nature and availability of data itself tend suggest certain desirable alternatives to the user. The data bank information system is shown in fig.





## 2. Predictive information system

This class of system is an extension of the databank information system. In this system prediction and inference making occurs when processing by the information system passes from basis data to conclusion about the source.



## 3. Decision making information system

In this system an organizations value system and criteria for choice are incorporated. This level of MIS is useful for structured decisions.

## 4. Decision taking information system

In this system the information system the user are assumed to be one For example a purchase order is released automatically when an inventory level reaches or goes below the reorder or send s remainders to vendors to supply goods when supply is overdue.

### 1.7.4. Implementation of MIS

The implementation plan involves the following steps:

1. Preparing organisational plans.
2. Planning of work flow.
3. Training of personnel.
4. Development of software.
5. Acquiring computer hardware.
6. Designing the format for data collection.
7. Construction of data files.

8. Operation of old and new systems in parallel.
9. Phasing out the old and inducting the new system.
10. Evaluation, maintenance and control of the new system.

## 1.8. DISADVANTAGES OF INFORMATION SYSTEM

Following disadvantages are likely to be there from information systems:

1. **‘Deskilling’ of workers:** Introduction of new technologies, especially for automation, sometimes render obsolete the existing skill of some workers. Many industries such as the automobile, steel, insurance industries, banks, have gone through periods of massive layoffs because of intense automation efforts. Therefore, while computerisation can increase operational efficiency and improve profits, sometimes it is also the root cause of workforce reduction.
2. **Information overload:** Generation of excessive amounts of information can overwhelm managers who must digest it and use it to make decisions. At times, this improvement also has its downside.
3. **Employee mistrust:** Employees sometimes fear that computers eventually replace them. They may view information system with scepticism; unless they are assured that their jobs are not in danger.
4. **Increased competitive pressure:** There is increased pressure on small and medium-scale industries, failing which they are steadily being pushed out of the marketplace by larger companies.
5. **Disenchantment with IS:** Many organisations are unable to value the information systems and technologies to their organisations vis-à-vis the return on investment. In coming years, the MIS will experience close scrutiny of its abilities to the delivery on its promises.
6. **Security breaches:** When organisation introduces new and sophisticated technologies, they must also find new ways to protect these assets from theft, pilferage, and security breaches. Therefore computers and information system actually increase the operating costs of an organisation.

## 1.9. APPROACHES OF MIS DEVELOPMENT

There are seven types of approaches used for developing MIS

### 1. **Top down approaches:**

This approach developed a corporate plan as a guide for designing the information system. Here top management takes the lead in formulating objectives, policies and plans and communicates them down the line to middle and supervisory management for translating them into reality.

### 2. **Bottom up approaches:**

It consists of following five steps:

- a. Individual functional applications are planned separately consisting of transaction processing, updating of files and simple reports.
- b. Files of various functional applications are integrated by means of indexing and changing into a database.
- c. Various functions are added to operate on the database and management control level.

- d. Integration of models into a model base having a wide verity of analysis, decision and planning models.
  - e. Strategic planning data planning models are added to the information system.
3. **Integrative approaches:**  
This approach permits managers at all levels to influence the design of MIS. Here evaluation, modification and approval of top management continue till a final design is acceptable to all levels.
  4. **Traditional approaches:**  
In this case activities are performed in sequence. Each activity is undertaken only when the previous activity is completed. Managers and users consider and review the work performed the MIS professionals during each stage of processing, in order to ensure accuracy and completeness.
  5. **Prototyping approaches:**  
In order to avoid any possible delay, prototyping approach is used. It is to developed a small or pilot version is called a prototype, which is built quickly and at lesser cost with the intention of modifying it when need arises.
  6. **End-user development approaches:**  
In this approach the increasing availability of low cost technology, end user development is popular in many organisations. Here the end user is responsible for system development.
  7. **Systematic approach for development in small organisations:**  
Since fewer MIS professionals shall be working having with variety of responsibilities that they have little time to develop new system for users. In a very small organisation, no MIS professional will exit. This does not mean that they cannot develop management information systems. They develop systems using the following steps:
    - ✓ Identify requirements
    - ✓ Locate, evaluate and secure software development.
    - ✓ Locate, evaluate and secure hardware.
    - ✓ Implement the systems.

## 1.10. CONSTRAINTS IN DEVELOPING AN MIS

Following are the constraints in developing an effective MIS:

1. No management system to build upon.
2. No clear definition of mission and purpose.
3. No objectives for the company.
4. Misorganisation.
5. Communication gap.
6. Lack of management participation.

## 1.11. MIS AND USE OF COMPUTER

Following are the main advantages of using computer technology in MIS:

1. Expanding scope for using system
2. Enhancing speed of processing and retrieval of data
3. Widening the scope of analysis.
4. Increasing complexity of system design and operation.

5. Integrating different information sub systems.
6. Increasing the effectiveness of information system.
7. Extending more comprehensive information to business managers.

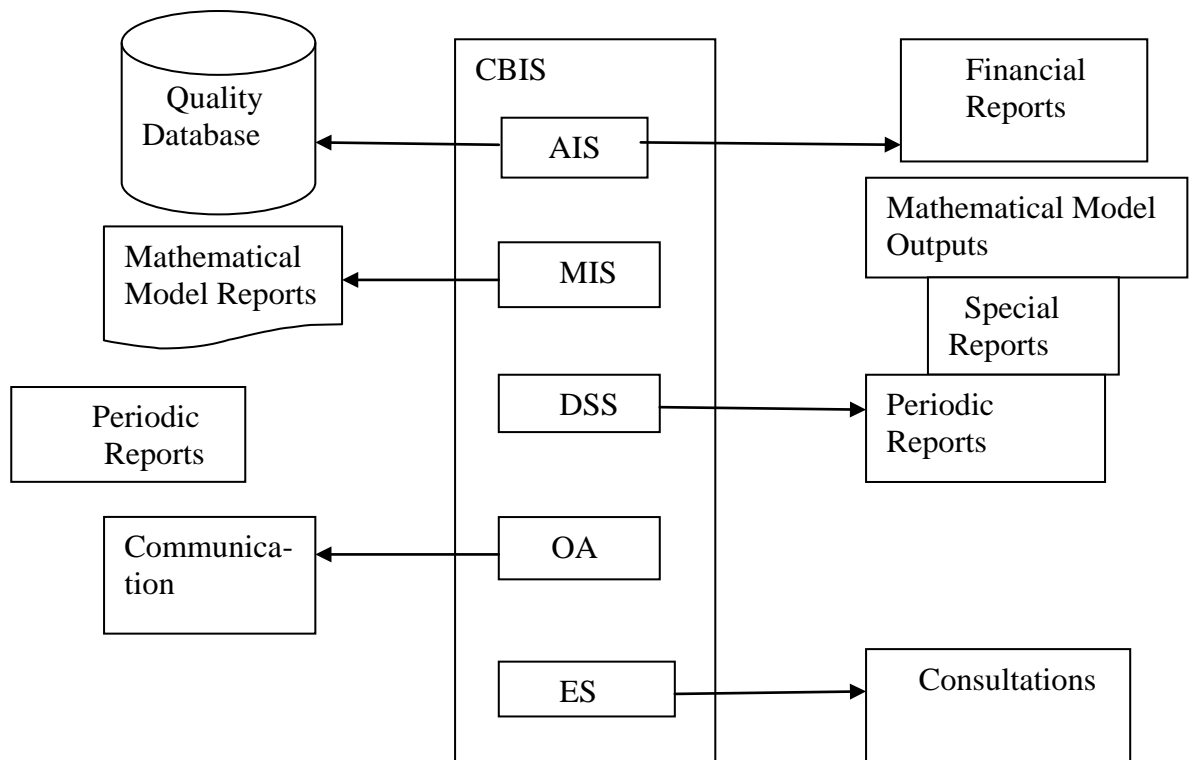
## 1.12. LIMITATIONS OF MIS

The limitations of MIS

1. MIS cannot replace managerial judgment in decision making. It is merely effective tool for the managers in decision making problem solving.
2. The quality of output of MIS is directly proportional to the quality of input and processes.
3. MIS cannot provide tailor made information packages. It is required to analyse the available information before decision making.
4. In a fast changing and complex environments, MIS may not have enough flexibility to update itself quickly.
5. MIS takes only quantitative factors into account.
6. MIS is less useful for making non programmed decisions.
7. MIS is less effective in organizations where information is not being shared with others.
8. MIS is less effective due to frequent changes in top management, organizational structure and operational staff.

## 1.13. COMPUTER BASED INFORMATION SYSTEMS

- Managers make decisions to solve problems and information is used in making the decisions.
- Information is presented in both oral and written forms by an information processor.
- It contains each of the computer based application areas:-Accounting Information System (AIS), Management Information System (MIS), Decision Support System (DSS), Office Automation (OA) and Expert System (ES).
- The term computer based information system (CBIS) is used to describe the five subsystems that utilize the computer.
- All of the CBIS sub-system provides information for problem solving.
- Each CBIS subsystem can support quality management. These are external customers that exist outside the firm. Information services interfaces with these external customers by means of the AIS. Much of the external customer's perception of the firm is based on the capabilities of the AIS to execute orders promptly and accurately. Hence, information system has a direct influence on the firm's product and service quality. IS also provides an indirect influence by providing information to users inside the firm.
- These are internal customers and they exist on all organizational levels and in all functional areas. The information enables these internal customers to do their jobs better, resulting in better products and services. In addition, the standard financial reports produced by AIS, such as the income statement and cost analyses, serve as a scorecard of the quality effort, reporting cost of rework, scarp customer returns, warranty claims and so on. Fig. shows each of these subsystems which provide information to be used in quality management.



**Fig.** CBIS sub-systems support-quality management

## CHAPTER-2

# INFORMATION SYSTEMS FOR DECISION MAKING

### 2.1. INTRODUCTION

The natures and scopes of information required by managers and different levels in an organisation vary considerably. Organisation required different types of information system to meet their needs. The fields of information system have come a long way in last few decades. An increasing no of managerial personnel rely on computers and information systems to make decisions. Managers at different levels in an organisation make different kind of decision (Operational, tactical and strategic). So, that the types of information necessary to support their decision are also different. Accordingly different types of information systems are designed to meet various information needs of managers.

There are four types of information systems exist:

1. Transaction processing system(TPS)
2. Management information system(MIS)
3. Intelligent support systems(ISS) consisting of decisions support systems (DSS), executive information systems(EIS)and expert systems(ES)
4. Office automation system(OAS)

### 2.2. TRANSACTION PROCESSING SYSTEM

The main purpose of transition processing system is to records, process validates & store transition death takes place in various function area of a business for future retrieval of use.

- Transaction can be **internal or external**. When a department order office supplies from the purchasing department an internal transaction occurs.
- When a customer places an order for a product an external transition occurs.
- This processing system is various used in this organisation such as finance accounting, manufacturing, production human resources, marketing, Engineer quality control and resource and development.

#### 2.2.1. Steps in Processing a Transaction

Data must be processed to become use full information .There are following 6 steps in processing a transaction.

1. Data entry
  2. Data validation
  3. Processing & revalidation
  4. Storage
  5. Output generation
  6. Query support
- **Data entry:** Transaction data must first be enter in to the system .A number of input devices exist for entering data including the key board & the mouse. The document generated at the

source where the transaction occurs are called source document & becomes input data for the system.

Example: when a customer returns an item at a store the sales receipt becomes the source document for the transaction return item for returned for replacement.

▪ **Data validation:**

- ✓ Data validation is essential in transaction processing. It ensures the accuracy & reliability of data by comparing actual data with predetermined standard or known results.
- ✓ There are 2 steps in validation. (1) Error detection. (2) Error correction.
- ✓ Error detection- Checking the data for appropriate format, checking for missing data, invalid data & inconsistency data.
- ✓ Error correction- Error correction procedures are designed to ensure that all have been corrected & that no errors have been introduced during the process. The technique used for correcting the error depends on the type of errors and the nature of the application.

▪ **Data Processing and revaluation:**

After the validation of accuracy & reliability of data, the data are processed in following 2 modes

- ✓ Online transaction processing.
- ✓ Batch processing.

❖ **Online transaction processing:**

Online means that the data input device directly linked to the TPS. The data are directly processed as soon as it is entered to the system. In this system the information is always with no time lag between data creation & data processing. Ex- ATM

❖ **Batch processing :**

- ✓ In batch processing, transactions are accumulated over time & processed periodically.
- ✓ Processing may be done on a daily, weekly, monthly basis or any other time period appropriate to the given application.
- ✓ e.g.-an organisation may process its sale proceeds on daily basis at the end of each day, and its daily expenses on a monthly basis.

▪ **Data storage.**

- ✓ Data storage is another important function because the values of usefulness of data diminish if data are not properly stored.
- ✓ E.g. magnetic tape is often used to store data i.e. batch processed. However, online transaction processing relies on other type of storage media, such as magnetic disk. It is to be noted that storage in output not always occurs in the same order. One can output the result of the transaction to the decision maker and then store them, or store the result and then output then to the decision maker.

▪ **Output generation.**

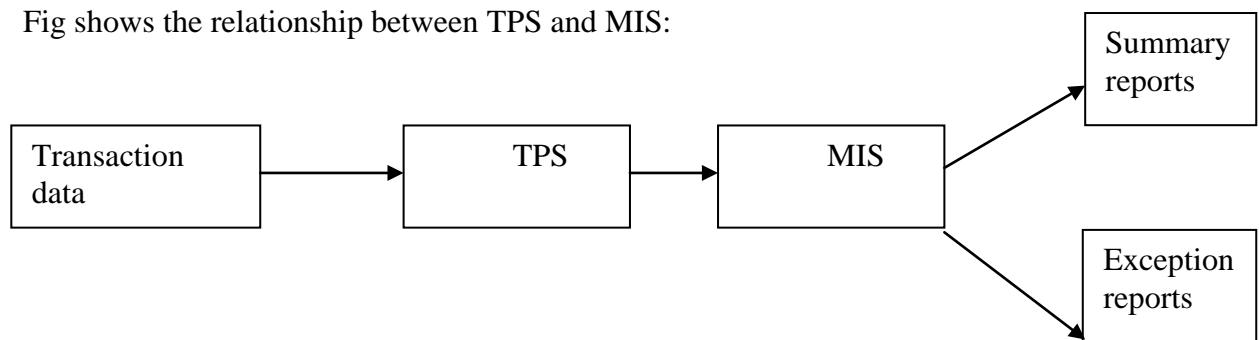
- ✓ The output can be communicated to the decision maker, after the data are input, validated, processed, revalidated, & stored, in the following 2 ways:
  - Documents and reports
  - Forms (screens and panels)
- ✓ Documents are popular output method. Some Examples: Invoices, pay checks, purchase invoices, sales receipts & job orders.

- ✓ A document is usually a record of one transaction, where as a report is a summary of two or more transactions. Nevertheless, these terms are obtained interchangeable.
- ✓ Computer o/p can also appear on computer screens & panels. Such soft-copy presentations are known as forms.
- **Query support.** (asking questions)
- ✓ It is facilities allow users to access data and information that may otherwise not be readily available.

## 2.3. MANAGEMENT INFORMATION SYSTEMS

- Management information systems are designed for providing information to the key functionaries in an organisation. These systems make use of the already processed of the already processed transaction data which is outputted from TPS and generate information reports after processing data. The output of an MIS takes the form of summary reports and exception reports. A summary report accumulates data from several transactions and presents the results in condensed form. For example a bank manager may get a summary report listing the total amount of deposits and withdrawals made the previous day. An exception report outlines any deviations from expected output. Its main purpose is to draw the attention of middle managers to any significant differences between actual performance and expected performance. For example a sales manager may study an exception report that lists all sales personnel who sold less than RS. 10000 or more than RS 50000 in the preceding month.

Fig shows the relationship between TPS and MIS:



**Fig: Interaction between TPS and MIS for Information Needs of an Organisation.**

### 2.3.1. Decision Making In MIS

- Decision making is an essential part of an management. Some have even suggested that management is synonymous with decision making are complex activities that involve many decisions of human behavior .Early classical models of management stressed the functions of managers , namely ,planning, organizing, staffing, coordinating, reporting, budgeting. Depending on the level at which managerial decision makers are they performing a different mix of managerial functions? There are primarily three levels of management and decision



making termed as strategic, technical/tactical and operational decision making. These three levels of decision making relate to one another closely. In essence management the functions that a manager performs the levels at which the decision maker is and on the type of decisions.



Fig: Decision making process

▪ **Types of Decisions:**

There are two types of decision making used in MIS. They are

1. Structured decisions.
2. Unstructured decisions.

➤ **Structured decisions**

Structured decisions are those that can be programmed. These decisions can be taken objectively. They are essentially repetitive, routine and involve a definite procedure for handling them. Herbert A. Simon termed structured decisions as programmed decisions. Programmed decisions are in fact those that are made in accordance with some policy, rule or procedure so that they do not have to be handled de novo each time they occur. It is for these reasons that such managerial problems are relegated to the supervisory level.

➤ **Unstructured decisions**

Unstructured decisions are those in which the decision maker must provide judgment, evaluation and insights into the problem definition. These decisions must be taken subjectively. Unstructured decisions are more respectively in nature, usually one-sort occurrences for which standard responses are usually not available. Hence, they require a creative process of problem-solving which is specially tailored to meet the requirement of situation on hand. In fact manager at higher level in an organisation are usually faced with more such unstructured decision making situation. Some have aptly described the situation as some what strategic in nature as compare to the tactical orientation of the structured decision at lower level of management. Strategic decisions are non-respective, vital and important and aim at determining or changing the ends or means of enterprise.

## 2.4. INTELLIGENT SUPPORT SYSTEMS

- Systems which facilitate decision requiring the use of knowledge, intuition, experience, and expertise, are called intelligent support system (ISS). Decision support systems (DSS), executive information systems (EIS) and artificial intelligence (AI) and expert systems (ES) fall into this category. These systems are explained in brief and their role in organisational decision making.

### 2.4.1. Decision support system:

- Decision support systems are interactive, well integrated systems that provide managers with data, tools and models to facilitate semi-structured decisions or tactical decisions. It automates the routine and repetitive elements in a problem while simultaneously supporting the use of intuition and judgement. DSS are ideally suited for problem like location selection, identifying new products to be marketed, scheduling personnel, and analysing the effect that price increases for resources have on profits.
- DSS are man/machine systems and are suitable of semi structured problems. The problem must be important to the manager and the decision required must be an important one. In addition, If an interactive computers based system is to be used then some of the following criteria must be met:
  - ✓ There should be a large data base,
  - ✓ Large amount of computation or data manipulation,
  - ✓ Complex interrelationships,
  - ✓ Analysis by stages,
  - ✓ Judgment required and
  - ✓ Communication
- It follows from the above criteria that DSS are inappropriate for unstructured problems and unnecessary for completely structured problems because they can be dealt with wholly by the computer. In outline, DSS require a database, the software to handle the database and decision support programs including eg. Modelling, spreadsheet and analysis packages, expert system etc.
- A DSS allows managers to perform goal seeking, which specifies the action a manager should take in order to accomplish a certain goal. Another important feature of DSS is that an individual or a group of individuals can use them. DSS that support group decision making are called **Group Decision Support Systems (GDSS)**. In most organizations, decision of any significance are made collectively by a group, not by a single person. GDSS are a set of interactive, well integrated systems that facilitate and support group decision making.

### 2.4.2. Executive information systems:

- EIS are forms of data retrieval systems that provide selected and summarised information for senior executive engaged in long range planning. Crisis management and other strategic decisions. It is a user friendly interactive system. It has excellent menus graphic capabilities. A typical way that an EIS works is by exception reporting and drilling down to investigate

the causes. For example a director of an organisation may be alerted that a particular department is well over budget. The manager would then drill down the data by pursuing lower and lower levels of detail.

### 2.4.3. Artificial intelligence and Expert systems:

- AI is a branch of computer science whose goal is to design and develop machines that emulate human intelligence. It attempts to endow machines with capabilities and characteristics that would indicate intelligence in human being.
- Expert systems (ES) also known as knowledge based system is a software designed to capture the knowledge and problem solving skills of human expert. It has three main components: a knowledge base, an inference engine, and a user interface.

Main characteristics of expert systems are:

- ✓ An expert system is a program designed to capture the knowledge and problem solving of human expert. Expert system is a branch of artificial intelligence.
- ✓ Expert systems handle problem that require knowledge, intuition, and judgment.
- ✓ Expert systems, unlike DSS and EIS, can replace decision makers.
- ✓ It has three main components: the knowledge base which stores the knowledge, the inference engine, which stores the reasoning principles used by the expert, and the user interface, which allows the user to interact with the system.
- ✓ Expert systems are not designed for any one level of management, their primary function is to disseminate expertise throughout the organisation

### 2.5. OFFICE AUTOMATION SYSTEM

OAS refers to the use of mechanical, electrical, & electronic devices to enhance communication in the work place & increase the efficiency & productivity of knowledge workers or clerical workers. OAS includes:

- ❖ Word processing
- ❖ Electronic mail
- ❖ Voice mail
- ❖ Audio conferencing
- ❖ Video conferencing
- ❖ Computer conferencing
- ❖ Tele conferencing
- ❖ Facsimile transmission
- ❖ Desktop publishing
- ❖ Video task
- ❖ Imaging
- ❖ Multimedia system

#### ▪ **Word processing:**

It is use of an electronic device that automatically performs many of the tasks necessary to create written document such as letters, memo, & report that are directed to the manager.

#### ▪ **Electronic mail:**

Electronic mail known as E-mail. It is the use of a network computer that allows users to send, store, and receive messages using the computers terminals & storage devices. It sends mail electronically from one computer to other.

▪ **Voice mail:**

Voice mail is just like electronic mail & performs storing, accessing, retrieving, and distributing messages using the telephone.

▪ **Audio conferencing:**

Audio conferencing is the use of voice communication equipment to establish an audio link between geographically dispersed persons for conducting a conference. The conference call, which allows more than 2 people to participate in a telephone conversation, was the first form of audio conferencing & is still in use.

▪ **Video conferencing:**

It is the use of television equipment to link geographically dispersed conference participants to engage in face to face communication. The equipment provides for audio as well as video linkage.

▪ **Computer conferencing:**

Computer conferencing is the use of a network computer to all members of a problem solving team to exchange information concerning the problem that is being solved.

▪ **Tele conferencing:**

It includes all three forms of electronically aided conferencing audio, video & computer.

▪ **Facsimile transmission:**

Facsimile transmission popularly known as fax is the transfer of written or pictorial information by the use of special equipment that can read a document image at one end of a communication channel & make a copy at the other end.

▪ **Desktop publishing:**

Desktop publishing is the use of a computer to prepare printed output, using software with sophisticated publishing capability.

▪ **Video task:**

It is the use of the computer for displaying a stored narrative & graphic material on a CRT screen.

▪ **Imaging:**

Imaging is the use of optical character recognises to convert paper or microfilm records to a digital format for storage in a secondary storage device for easy retrieval & processing.

▪ **Multimedia system:**

Multimedia system are well integrated systems that store, retrieve, & process different types of data such as text, graphics, image, full motion video, audio, & animation.

It helps users to create, process, share, & display information in a broad variety of formats.

## 2.6. CHARACTERISTICS OF INFORMATION SYSTEM

▪ **Transaction Processing System (TPS)**

- ✓ **Input:** Transaction related data.
- ✓ **Processing:** Use procedure & rules.
- ✓ **Output:** Summaries of transaction.
- ✓ **Users:** Lower-level managers.
- ✓ **Application:** Sales transaction applications, Credit & payment, Insurance claims.

- **Management Information System (MIS)**
  - ✓ **Input:** Output from TPS & other internal data.
  - ✓ **Processing:** Measures & monitors operational performance.
  - ✓ **Output:** Summary & exception reports.
  - ✓ **Users:** Middle level managers.
  - ✓ **Application:** Monthly production report.
- **Intelligent Support System (ISS)**
  - ✓ **Input:** Internal & external data & models.
  - ✓ **Processing:** Interactive ad-hoc reporting.
  - ✓ **Output:** Alternatives & Analysis reports.
  - ✓ **Users:** Top managers.
  - ✓ **Application:** Investment portfolios.
- **Office Automation System (OAS)**
  - ✓ **Input:** Data & information.
  - ✓ **Processing:** Formatting, Summarizing & Displaying.
  - ✓ **Output:** Document, Graphics, Multimedia.
  - ✓ **Users:** Knowledge & Clerical workers.
  - ✓ **Application:** Fax, Multimedia, Video conferencing.

## CHAPTER-3

# COMPUTER HARDWARE FOR INFORMATION SYSTEMS

### 3.1. INTRODUCTION

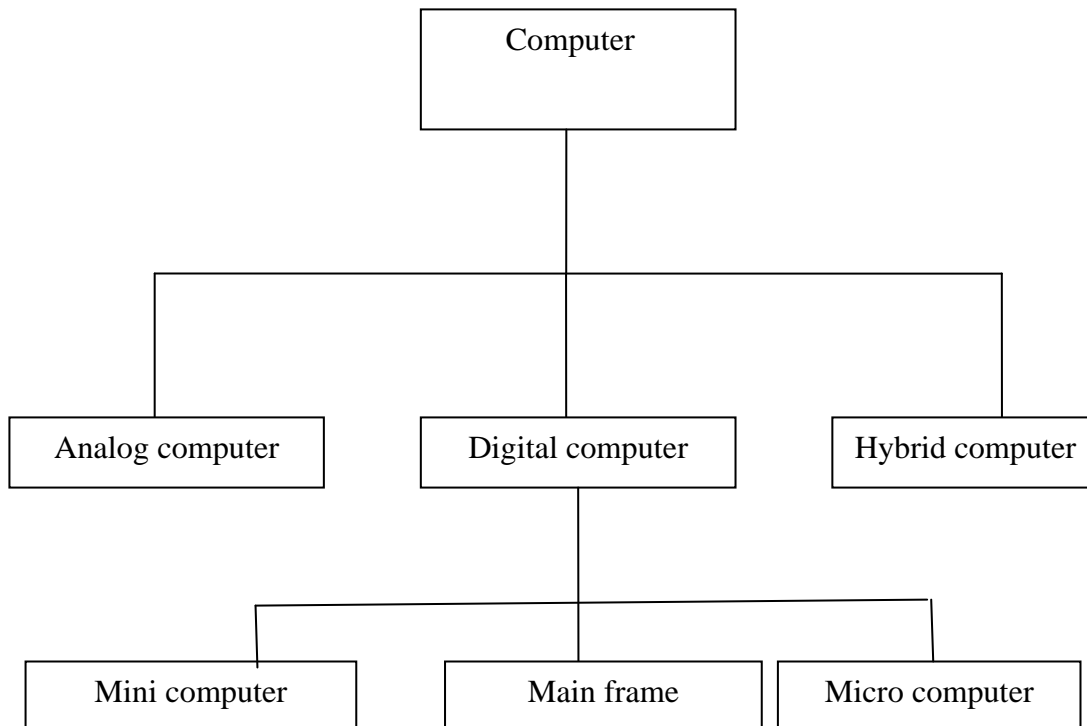
- A computer is an automatic machine made up of electronic and electro mechanical devices that processed data under program control to generate meaningful information with speed and accuracy.
- It can perform long and complex calculations, and analyse complex scientific or mathematical data. Computer hardware includes the physical computer and its peripheral components, is given. Input, output and storage devices, along with other types of computers, are identified and explained.

### 3.2. BASICS OF DATA REPRESENTATION

- Data are usually represented in a computer by using the numbers, alphabets-A to Z symbols, graphs and images.
- This form of representation is used to formulate problem and fed to the computer.
- The processed output is required in the same form. This form representation is called external data representation.
- However the computer can understand data by strings of binary digits, or bits.
- A bit is a smallest unit of data in a computer. It is represented by a 1 or a 0.
- A unique combination of eight bits referred to as a byte, represents each character in a computer.
- Two most important characteristics of hardware in a computer are speed and size.
- Computer processing time is measured in millions of a second; the instructions processed per second is expressed in **MIPS** (million instruction per second).
- The units of time and size used to describe a computer are as follows:

UNIT	SIZE OF MEMORY
Byte	8 bits
Kilobyte (KB)	1000 ( $10^3$ ) bytes
Megabyte (MB)	1000000( $10^6$ ) bytes
Gigabyte (GB)	1000000000( $10^9$ ) bytes
Terabyte	1000000000000( $10^{12}$ ) bytes

### 3.3. TYPES OF COMPUTERS



#### ❖ Analog Computer

Analog computers are used to process continuous data. Analog computers represent variables by physical quantities. Thus any computer which solve problem by translating physical conditions such as flow, temperature, pressure, angular position or voltage into related mechanical or electrical related circuits as an analog for the physical phenomenon being investigated in general it is a computer which uses an analog quantity and produces analog values as output. Thus an analog computer measures continuously. Analog computers are very much speedy. They produce their results very fast. But their results are approximately correct. All the analog computers are special purpose computers.

#### ❖ Digital Computer.

Digital computer represents physical quantities with the help of digits or numbers. These numbers are used to perform Arithmetic calculations and also make logical decision to reach a conclusion, depending on, the data they receive from the user. Digital computer classified into 3 types. These are:

- **Main Frame Computer**

The most expensive, largest and the most quickest or speedy computer are called mainframe computers. These computers are used in large companies, factories, organizations etc. the mainframe computers are the most expensive computers; they cost more than 20 million rupees. In these computers 150 users are able to work on one C.P.U. The mainframes are able to process 1 to 8 bits at a time. They have several hundreds of megabytes of primary storage and operate at a speed measured in nano second.

- **Mini Computer**

Mini computers are smaller than mainframes, both in size and other facilities such as speed, storage capacity and other services. They are versatile that they can be fitted where ever they are needed. Their speeds are rated between one and fifty million instructions per second (MIPS). They have primary storage in hundred to three hundred megabytes range with direct access storage device.

- **Micro Computer**

These are the smallest range of computers. They were introduced in the early 70's having less storing space and processing speed. Micro computers of today's are equivalent to the mini computers of yesterday in terms of performing and processing. They are also called "computer of a chip" because its entire circuitry is contained in one tiny chip. The micro computers have a wide range of applications including uses as portable computer that can be plugged into any wall.

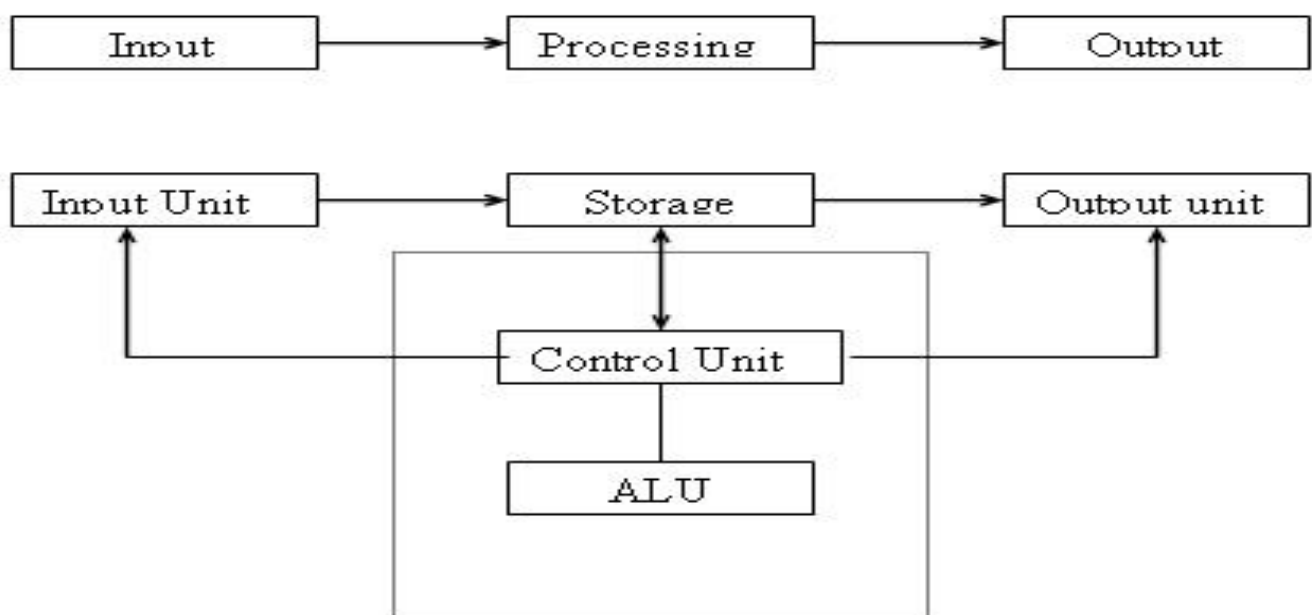
- ❖ **Hybrid Computer**

Various specifically designed computers are with both digital and analog characteristics combining the advantages of analog and digital computers when working as a system. Hybrid computers are being used extensively in process control system where it is necessary to have a close representation with the physical world. The hybrid system provides the good precision that can be attained with analog computers and the greater control that is possible with digital computers, plus the ability to accept the input data in either form.

### 3.4. BASIC COMPONENTS OF COMPUTER SYSTEMS

The computer system consists of four units:-

- ✓ Input unit
- ✓ Central Processing Unit (CPU) Consisting of ALU (Arithmetic logic unit), Control Unit and Memory Unit.
- ✓ Secondary Storage Unit.
- ✓ Output Unit.



- ❖ **Input Unit:** This unit is used for entering data and programs into the computer system by the user for processing.



- ❖ **Storage Unit:** The storage unit is used for storing data and instructions before and after processing.
- ❖ **Output Unit:** The output unit is used for storing the result as output produced by the computer after processing.
- ❖ **Central Processing Unit (CPU):** The task of performing operations like arithmetic and logical operations is called processing. The Central Processing Unit (CPU) takes data and instructions from the storage unit and makes all sorts of calculations based on the instructions given and the type of data provided. It is then sent back to the storage unit. CPU includes Arithmetic logic unit (ALU) and control unit (CU)
- ✓ **Arithmetic Logic Unit:** All calculations and comparisons, based on the instructions provided, are carried out within the ALU. It performs arithmetic functions like addition, subtraction, multiplication, division and also logical operations like greater than, less than and equal to etc.
- ✓ **Control Unit:** Controlling of all operations like input, processing and output are performed by control unit. It takes care of step by step processing of all operations inside the computer.
- ❖ **Memory**

Computer's memory can be classified into two types

- ✓ **Primary memory**
- ✓ **Secondary memory**

- **Primary Memory**

It can be classified into two types:-

1. **RAM** (Random Access Memory)
2. **ROM** (Read Only Memory)

- ✓ RAM or Random Access Memory is the unit in a computer system. It is the place in a computer where the operating system, application programs and the data in current use are kept temporarily so that they can be accessed by the computer's processor. It is said to be 'volatile' since its contents are accessible only as long as the computer is on. The contents of RAM are no more available once the computer is turned off.
- ✓ ROM or Read Only Memory is a special type of memory which can only be read and contents of which are not lost even when the computer is switched off. It typically contains manufacturer's instructions. Among other things, ROM also stores an initial program called the 'bootstrap loader' whose function is to start the operation of computer system once the power is turned on.

- **Secondary Memory**

Secondary storage devices are of two types: 1. magnetic 2. Optical Magnetic devices include hard disks and optical storage devices are CDs, DVDs, Pen drive, Zip drive etc.

- ✓ **Hard Disk**

Hard disks are made up of rigid material and are usually a stack of metal disks sealed in a box. The hard disk and the hard disk drive exist together as a unit and is a permanent part of the computer where data and programs are saved. These disks have storage capacities ranging from 1GB to 80 GB and more. Hard disks are rewritable.

Example of secondary memory:-

- ✓ **Compact Disk**

Compact Disk (CD) is portable disk having data storage capacity between 650-700 MB. It can hold large amount of information such as music, full-motion videos, and text etc. CDs can be either read only or read write type.

✓ **Digital Video Disk**

Digital Video Disk (DVD) is similar to a CD but has larger storage capacity and enormous clarity. Depending upon the disk type it can store several Gigabytes of data. DVDs are primarily used to store music or movies and can be played back on your television or the computer too. These are not rewritable.

❖ **Input / Output Devices:**

These devices are used to enter information and instructions into a computer for storage or processing and to deliver the processed data to a user. Input/Output devices are required for users to communicate with the computer. In simple terms, input devices bring information INTO the computer and output devices bring information OUT of a computer system. These input/output devices are also known as peripherals since they surround the CPU and memory of a computer system.

❖ **Input Devices**

An input device is any device that provides input to a computer. There are many input devices, but the two most common ones are a keyboard and mouse. Every key you press on the keyboard and every movement or click you make with the mouse sends a specific input signal to the computer.

Example of input device:-

- **Keyboard:**

- It is an input device. In the key board the keys are arranged in matrix from having rows and columns. The keys in the keyboard are: Alphabetic keys, Numeric Keys, Control Keys and Function keys. Alphabet Keys and numeric Keys cause the corresponding characters appear on the screen. Control keys are used to perform some action and function keys are used to perform some function as defined by the software or user.

- **Mouse:**

- A device that controls the movement of the cursor or pointer on a display screen. A mouse is a small object you can roll along a hard and flat surface. Its name is derived from its shape, which looks a bit like a mouse. As you move the mouse, the pointer on the display screen moves in the same direction.

- **Trackball:**

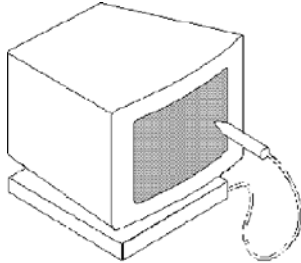
- A trackball is an input device used to enter motion data into computers or other electronic devices. It serves the same purpose as a mouse, but is designed with a moveable ball on the top, which can be rolled in any direction.

- **Touchpad:**

- A touch pad is a device for pointing (controlling input positioning) on a computer display screen. It is an alternative to the mouse. Originally incorporated in laptop computers, touch pads are also being made for use with desktop computers. A touch pad works by sensing the user's finger movement and downward pressure. • Touch Screen: It allows the user to operate/make selections by simply touching the display screen. A display screen that is

sensitive to the touch of a finger or stylus. Widely used on ATM machines, retail point-of-sale terminals, car navigation systems, medical monitors and industrial control panels.

- **Light Pen:**
- Light pen is an input device that utilizes a light-sensitive detector to select objects on a display screen.



- **Magnetic ink character recognition (MICR):**
  - MICR can identify character printed with a special ink that contains particles of magnetic material. This device particularly finds applications in banking industry.
  - **Optical mark recognition (OMR):**
  - Optical mark recognition, also called mark sense reader is a technology where an OMR device senses the presence or absence of a mark, such as pencil mark. OMR is widely used in tests such as aptitude test.
  - **Bar code reader:**
  - Bar-code readers are photoelectric scanners that read the bar codes or vertical zebra strips marks, printed on product containers. These devices are generally used in super markets, bookshops etc.
  - **Scanner:**
- It is an input device that can read text or illustration printed on paper and translates the information into a form that the computer can use. A scanner works by digitizing an image.



#### ❖ **Output Devices:**

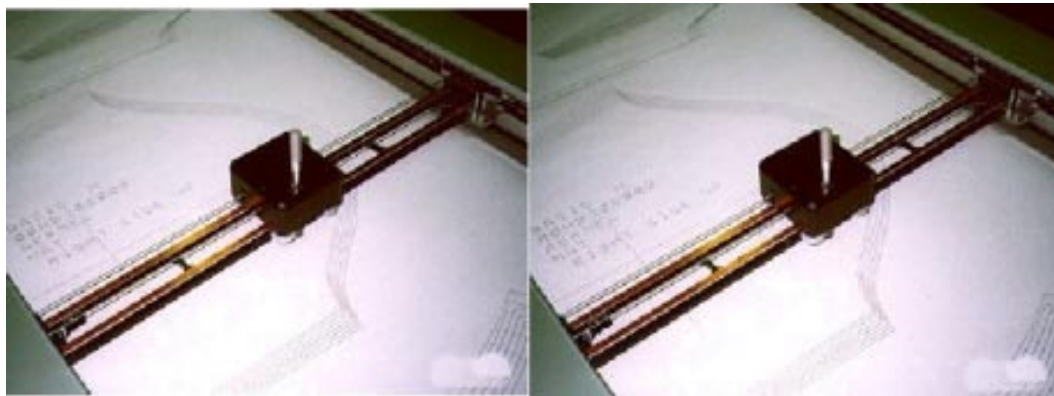
Output device receives information from the CPU and presents it to the user in the desired form. The processed data, stored in the memory of the computer is sent to the output unit, which then converts it into a form that can be understood by the user. The output is usually produced in one of the two ways – on the display device, or on paper (hard copy).

Example of output device:-

- **Monitor:** is often used synonymously with “computer screen” or “display.” Monitor is an output device that resembles the television screen. It may use a Cathode Ray Tube (CRT) to display information. The monitor is associated with a keyboard for manual input of characters

and displays the information as it is keyed in. It also displays the program or application output. Like the television, monitors are also available in different sizes.

- **Printer:** Printers are used to produce paper (commonly known as hard copy) output. Based on the technology used, they can be classified as Impact or Non-impact printers.
- Impact printers use the typewriting printing mechanism wherein a hammer strikes the paper through a ribbon in order to produce output. Dot-matrix and Character printers fall under this category.
- Non-impact printers do not touch the paper while printing. They use chemical, heat or electrical signals to etch the symbols on paper. Inkjet, DeskJet, Laser, Thermal printers fall under this category of printers.
- **Plotter:** Plotters are used to print graphical output on paper. It interprets computer commands and makes line drawings on paper using multi colour automated pens. It is capable of producing graphs, drawings, charts, maps etc.



- **Facsimile (FAX):** Facsimile machine, a device that can send or receive pictures and text over a telephone line. Fax machines work by digitizing an image.
- **Sound cards and Speaker(s):** An expansion board that enables a computer to manipulate and output sounds. Sound cards are necessary for nearly all CD-ROMs and have become commonplace on modern personal computers. Sound cards enable the computer to output sound through speakers connected to the board, to record sound input from a microphone connected to the computer, and manipulate sound stored on a disk

### 3.5. FACTORS TO BUY A PC:

Following six factors must be considered while buying a pc:

- a) Processor- the 286,the 386,the 486 and the Pentium,
- b) Clock speed- varies between 25 MHz and 100 MHz,
- c) RAM- speed rating in the range of 60,70,100 MHz,
- d) Expansion slots and buses-adding features and capabilities to one's own computer and the type of electrical connection used in an expansion slot.
- e) Monitor- size, resolution, tricolour, interlaced or non-interlaced, radiation levels, and video boards.
- f) Upgrade-Combining some parts of an existing PC with some new components, with the result cost may be lower then that of a new system.

## CHAPTER-4

# COMPUTER SOFTWARE FOR INFORMATION SYSTEMS

### 4.1. INTRODUCTION

An information system builds both hardware and software are essential, systems being used in organisations are driven by a programs. A program is a set-up stepwise instruction given to a computer to accomplish various tasks. Programs are write software using special languages called programming languages. The process of writing program is referred to as programming. A set of program which instructs the hardware to perform a job is called as software.

### 4.2. PROGRAMMING LANGUAGES

There are two types of programming languages

1. Procedural language.
2. Non-procedural language.

#### ⇒ **Procedural Language:**

A language, which explains stepwise sequential explanation to accomplish a given task, is called as procedural language.

#### ⇒ **Non-Procedural Language:**

A non-procedural language focuses on what needs to be done, without specifying exactly how it should be done.

#### ❖ **FIRST GENERATION LANGUAGES (MACHINE LANGUAGE):**

- The early computers were programmed in machine language or 1<sup>st</sup> generation language.
- A series of zeroes & ones then the CPU can interpret & execute. Machine language is important because it is the only language that the computer understands. Since machine language is difficult to use. Computer scientist development, programming language which more closely resembled human communication.
- The program is written in the programmer's language & is translate into the machine language before it is run.
- The program written by the programmer is known as the source program. The machine language is called as the object program.
- The system software translate the source program into the object program is called translator.

#### ❖ **SECOND GENERATION LANGUAGE (THE ASSEMBLERS):**

- The 1<sup>st</sup> translator ware called **assemblers**. They permitted the programmer to code programs in assembly language or 2<sup>nd</sup> generation language.
- An assembly language mnemonic name for the operations that are to be performed symbolic names for the data that is processed.
- Assembly language was a big improvement over machine language from the programmer's point of view, but it had several draw backs.
- The assemble language programs are to be lengthy and ware difficult for programmers to read.

❖ **THIRD GENERATION LANGUAGES (3 GLs)**

- 3<sup>rd</sup> generation language can produce multiple object program instruction from a single source program instruction. It means that programmers have to produce fewer lines of code in addition the syntax of 3<sup>rd</sup> generation language is more like the user's language.
- Compiler produce a complete object program in one process then the object program is executed.
- An interpreter translates a source program instruction & executes it before going on the next instruction.
- COBOL, FORTRAN & PL/I are compiler language and basic program are interpreter languages.

❖ **FOURTH GENERATION LANGUAGES (4GLs)**

- 4<sup>th</sup> generation languages were developed in the 1970 to overcome the demands of procedural programming language.
- 4<sup>th</sup> generation languages are non-procedural languages. It allow the programmer & users to instruct the computer in what to do rather than how to do it.
- The term natural language is also used because the syntax of the 4<sup>th</sup> generation language can be very similar to our everyday speech.
- (i) Data base query languages  
(ii) Modelling languages  
(iii) Very high level languages  
(iv) Graph generators  
(v) Report writers  
(vi) Application generators

⇒ **Database query language:**

⇒ It is shown here how a manager can use a data base query language that provides a special report from database contents without the need to code a program. The 4GL used in the example is FOCUS.

⇒ **Modelling languages:** A modelling language is especially designed to make the building of mathematical models easier than when a problem oriented language is used. One of the first modelling languages was GPSS (General purpose simulation system), developed by IBM in the early 1960s. The most popular ones that followed include DYNAMO, SLAM, SIMSCRIPT, GASP, MODEL, and IFPS.

⇒ **Very high level language:** The term very high level language is often used to describe a programming language, such as APL, that offers succinctness and power over and above that of conventional languages.

⇒ **Graph Generators:** A graph generator is also called a graphics package, is used to display or print data in a variety of graphical forms.

⇒ **Report writers:** A report writer is specifically designed to prepare reports. The first example was RPG (Report program generator). COBOL has a report writer feature as do most of the database management systems.

⇒ **Application Generators:** An application generator produces an application program such as inventory or payroll, without programming. Examples are MANTIS and MARKV.



- ⇒ Some popular third and fourth generation programming language are briefly explained
- ⇒ **BASIC:** BASIC is an acronym for Beginners' All purpose symbolic instruction code. Program developed at Dartmouth College in 1964 by John Kemeny and Thomas Kurtz. It is usually the first computer language that novice programmers learn. BASIC is a procedure oriented; general purpose language that is widely used for commercial and scientific applications. It is flexible and easy to learn but is not portable.
- ⇒ **FORTAN:** FORTAN is an acronym for Formula Translation. The program was developed by IBM in the mid-1950s. Like BASIC FORTAN is a general purpose, procedure oriented language. It is widely used for scientific and engineering applications and number crunching. A large number of languages developed after FORTAN have been influenced by its structure. However it lacks flexibility in input/output operations.
- ⇒ **COBOL:** COBOL is an acronym for Common Business Oriented Language. The program was developed at the pentagon in 1959, the product of a joint effort by the federal government and the computer industry. COBOL is a dominant language of the business world and many industries use thousand of lines of code written in COBOL. It is easy to learn and has English like structure. It is excellent for processing large data files and performing repetitive tasks.
- ⇒ **PASCAL:** PASCAL was developed Niklaus wirth of the federal institute of technology in Zurich, Switzerland in 1968. It is named for the seventeenth century French mathematician Blaise pascal. PASCAL is widely used for business and scientific applications. The language is easy to learn and allows a programmer structure programming problems.
- ⇒ **C Language:** C is a general purpose language. It is called C because it was an improvement over another language called B that was developed at AT &T Bell Labs in early 1970s. C was developed by Brian Kernighan and Dennis Ritchie. It is closely associated with the UNIX system since the language was developed on UNIX. Although UNIX was initially written in assembly language, Dennis Ritchie later rewrote UNIX in C. In a short time C has become an extremely popular language and is now widely used in system development applications and for commercial uses.

### 4.2.1. Object oriented programming

- ⇒ Object oriented programming also abbreviated as OOP is also a programming language to enhance the productivity of programmers and reduces software development time. In OOP systems are modelled using chunks of programming a data called objects. Each object includes programming code that specifies how it should behave how it should manipulate data, respond to messages from other objects, and send messages of its own.
- ⇒ A significant benefit of OOP is code reusability, i.e., the same piece of code can be use for different applications. Today code reusability has not only become desirable but also essential in many software development environments. It is estimated that half of the code required for most applications already exists and that an estimated 40% and 60% of all new code can come from software libraries of reusable components. Also OOP reduces amount of testing required. OOP software is easier to update because some aspects of an object have been often to be modified.

### 4.2.2. Visual Programming:

- ⇒ Visual programming facilitates users to visualize their code and its impact on the system. The program allows a user to download competitors advertised prices from an external database. It then compares the competitor's prices with those of the user organisation and graphically displays comparisons of the prices.
- ⇒ Microsoft Company has developed visual BASIC, designed to allow users to integrate Microsoft Windows application. This feature can reduce the development time for many applications. Visual BASIC serves as a common macro language for Access, Power point, Word and Excel.

### 4.3. CLASSIFICATION OF SOFTWARE:

There are two types of computer software are available:

- **System software**
- **Application software**

#### 4.3.1. System Software

There are three basic types of system software:

- ⇒ System control software
- ⇒ System support software
- ⇒ System development software.
- ⇒ **System control software:** System control software helps to monitor, control, coordinate, and manage the resources and functions of a computer system. System control software can be classified into two categories:-
  - Operating system and its functions
  - Operating system environments.
- ❖ **Operating system and its functions:** The operating system manages the computers processes, functioning as an interface between the user the software that processes the firm's data and the hardware. Major functions of an operating system include:
  - Helping a CPU to manage or control internal computer operations
  - Facilitating communications between an user and a CPU
  - Enabling a CPU to communicate with other peripheral devices
  - Automating certain program functions to increase the operating efficiency of a computer system as a whole.
  - Other six basic functions that an operating system can perform are:
    - Schedule jobs
    - Manage hardware and software resources
    - Maintain system security
    - Enable multiple user resource sharing
    - Handle interrupts



- Maintain usage records

❖ **Operating system environment:** There are two types of operating system environments:

- **Multiprogramming:** It is a computing environment in which multiple users can run multiple programs on a single CPU computer at the same time. The CPU switches between programs, however at any given time is executing only one program.
- **Multiprocessing:** it is system has a number of processors that process data and instructions, unlike systems that have only one CPU. It is ideally suited for complex and computationally intensive operations that require extensive processing.

⇒ **System support software:** Programs which support the smooth execution of various programs and operations of a computer are called system support software. System support software includes utility programs, programming services software, database management systems, and security software and system documentation.

❖ **Utility programs**

These are among the most popular types of system support software. They perform tasks such as formatting disks, locating free space on a disk, retrieving lost or damaged files, sorting and merging data, converting files from one format to another, backing up important files and providing online help.

❖ **Programming services software**

It includes

- Language translators
- System loaders
- Link editors,
- System librarians.

❖ **Database management system**

It is a set of computer programs that enables a user to define, create access, manipulate, and output the information in records stored on a database.

❖ **Security software**

It protects a computer system and its files from unauthorized access. Examples of security software includes

- Password programs
- File protect programs
- Encryption software.

❖ **System documentation**

It includes manual, flowcharts, reference, guides, and other operating instructions.

⇒ **System development software:**

It helps design and build better system, e.g. a collection of programs that assist developers in developing an information system also called as computer aided software engineering (CASE).

### 4.3.2. Application Software:

Application software assists in managing the organisation's physical and conceptual resources.

There are two types of application software:

- ⇒ General purpose software
- ⇒ Dedicated software
- ⇒ **General purpose software:** it is designed for general applications such as payroll, inventory management, and accounting. Dedicated software is designed for specific application such as space shuttle.
- ⇒ **Dedicated software:** it includes specialised or customised applications designed for specific purposes. For example, logistic software helps firms handle the flow of goods and services from one location to another in order to cut costs, minimize inventory, and reduce the time it takes for goods, services, or information to reach their destination.

#### 4.4. ROLE OF SOFTWARE IN PROBLEM SOLVING

- ⇒ Software can play either a direct or an indirect role in problem solving. System software always plays in indirect role.
- ⇒ On the other hand, application software can play either a direct or an indirect role.
- ⇒ Most general business and industry specific packages are designed to play an indirect role by creating and maintaining the database that provides the basis for the information oriented subsystems.
- ⇒ Some industry specific packages go beyond data processing, providing components that directly contribute to problem solving.
- ⇒ Some organizational and personal productivity software only indirectly affects problem solving by simplifying the creation and transmission of data.
- ⇒ Other productivity software such as electronic spreadsheet, project management, forecasting, and statistical analysis packages provides direct support.

#### 4.5. CRITERIA FOR INVESTMENT IN HARDWARE AND SOFTWARE

Investment in information systems and technologies include the acquisition of hardware, software, networks, and other computer related systems and technologies. Criteria for investment means the standards that an organisation uses to make computer related investment decisions. Table lists some criteria that organisation use to make information system and information technology investment decisions and the extent of use of each criterion.

**Table: Criteria for investment used in organizations for purchasing hardware:**

Criteria	Percentage of companies using criteria
<b>Financial criteria</b>	
<b>Discounted cash flow (DCF)</b>	
1. Net present value	49
2. Internal rate of return	54
3. Profitability index method	8
<b>Other financial</b>	

4. Average/accounting rate or return	16
5. Payback method	61
6. Budgetary constraints	68
<b>Management criteria</b>	
7. Support of explicit business objectives	88
8. Support of implicit business objectives	69
9. Response to competitive systems	61
10. Support for management decision making	88
11. Probability of achieving benefits	46
12. Legal/Government requirements	71
<b>Development criteria</b>	
13. Technical/system requirement	79
14. Introduce/ learn new technology	60
15. Probability of project completion	31

# CHAPTER-5

## DATA COMMUNICATIONS SYSTEM

### 5.1. INTRODUCTION

Data communication is the movement of data and information from one point to another point by means of electrical or electromagnetic devices, fibre-optic cables or microwave signals.

### 5.2. TELECOMMUNICATIONS SYSTEM

Telecommunications system has five components. These are

**1. Sender:** - input devices.

**2. Channel & Media:** -channel characteristics.

- Transmission Speed.
- Transmission Mode.
- Transmission direction

**Media**

- Bounded.
- Unbounded.

**3. Hardware:** -

- Host Computer,
- Front end Processor,
- Modem,
- Multiplexer,
- Switch.
- Bridge
- Gateway
- Bus.

**4. Software:** -

- Access Control.
- Transmission control.
- Network control & Management.
- Error detection & Correction.
- Network Security.

**5. Receiver:** -Output Devices.

#### 5.2.1. Telecommunications Channels

A data communications channels is a path through a medium that data can take from sending stations to receiving stations.

**Characteristic of channels are:**

- **Transmission Speed: -**

It is the capacity of a telecommunication channel depending on the bandwidth. The greater bandwidth the greater amount of information transmitted over the channel. There are three types of bandwidth:-

- ✓ Voice-band (300 bps to 9600 bps),
- ✓ Medium band (9600bps to 256000bps).
- ✓ Broadband (256000bps to a very large number.)
- **Transmission Mode:-** There are two types of transmission mode
  - ✓ **Synchronous:-** In this transmission a group of characters transmit at a time.
  - ✓ **Asynchronous: -** In this transmission one character transmit at a time.
- **Transmission direction:-** It is the direction in which data is transmitted . There are three types of directions:
  - ✓ **Simplex: -** In this direction data communication devices that can either send or receive data, but can not do both.
  - ✓ **Half duplex: -** In this case two devices are send or received data, but not at a time.
  - ✓ **Full duplex: -** In this case two devices are send or received data at a time.

### 5.2.2. Telecommunications Media

There are two types of media over with data is transmitted.

- **Bounded media-** The signals are confined to the medium. Ex-Twisted pair cable, fibre-optic cables, coaxial cable.
- **Unbounded media-** The signal are not restricted to the medium. Ex-Microwaves.

### 5.3. DATA COMMUNICATIONS HARDWARE

- **Host Computer:-** The host performs the data processing for the network. The incoming messages are handled in the same manner as data received from any other type of input unit .After the processing, messages can be transmitted back to the front –end processor for routing.
- **Front-end processor:-** The front-end processor is a minicomputer that acts as a buffer between the client device and the host computer. It increases the operating efficiency of the network by taking care of routine tasks such as coordinating peripherals and ensuring error-free transmission.
- **Modem:-** It stands for modulator-demodulator. It is used for Digital signals are converted into analog signals and vice-versa.
- **Multiplexer:-** It is a device that permits the simultaneous sending and receiving of multiple messages over a signal channel. A multiplexer collects signals from several terminals and transmits them over a single channel.
- **Switch:-** It is a device which is determines the data transmission path. Switches can control the transmission path across national or local networks.
- **Bridge and gateway:-**
  - A **bridge** is a device that separates two or more network segments with in one logical network (e.g. a single IP-subnet). A bridge is usually placed between two separate groups

of computers that talk with each other, but not that much with the computers in the other group.

- A **gateway** is a node (a router) on a TCP/IP network that serves as an access point to another network. A default gateway is the node on the computer network that the network software uses when an IP address does not match any other routes in the routing table.
- **Bus:** - A collection of wires through which data is transmitted from one part of a computer to another.

## 5.4. DATA COMMUNICATIONS SOFTWARE

- Software enables all of the data communication hardware units to work as one system. Most of the software is located in the host and in the front-end processor, but some can be located in the cluster control units and the terminals.
- It is necessary that communications software must interface the user's applications programs with the access method that has been selected to control the network, keeping in view that the telecommunications access methods themselves are control programs of a sort.
- Various types of computer software are:
  - ✓ **Access control software:** This software establishes access between different devices, terminals and computers in the network and checks the transmission mode, transmission speed and transmission direction. It has two types:-1.centralised.2.decentralised.
  - ✓ **Terminal Control Software:** This software controls the transmission of data over the network.
  - ✓ **Terminal emulation software:** This software enables a microcomputer to behave like specific terminal when in interact with a mainframe.
  - ✓ **Network control software:** The software coordinates controls and manages the complete operation of the network. It establish priority for data waiting to be transmitted, check for any transmission error, route message, and maintain statistics system used.
  - ✓ **Error correction and detection software:** It ensures that errors, caused by any other problem, are detected and connected.
  - ✓ **Security software:** The software prevents unauthorized access to data and monitors the use of the network.

## 5.5. COMMUNICATION NETWORKS

There are five types of communication networks:

1. **Private Branch Exchanges (PBXs)**
2. **Integrated Services Digital Networks (ISDNs)**
3. **Local Area Networks (LANs)**
4. **Wide Area Networks (WANs)**
5. **Value Added Networks (VANs)**

### 5.5.1. Private Branch Exchanges (PBXs)

- PBX (private branch exchange) is a telephone system within an enterprise that switches calls between enterprise users on local lines while allowing all users to share a certain number of external phone lines.
- The main purpose of a PBX is to save the cost of requiring a line for each user to the telephone company's central office.
- The PBX is owned and operated by the enterprise rather than the telephone company (which may be a supplier or service provider).
- Private branch exchanges used analog technology originally.
- Today, PBXs use digital technology (digital signals are converted to analog for outside calls on the local loop using plain old telephone service (POTS ).
- A PBX includes:
  - Telephone trunk (multiple phone) lines that terminate at the PBX
  - A computer with memory that manages the switching of the calls within the PBX and in and out of it.
  - The network of lines within the PBX.
  - A console or switchboard for a human operator (optional)

### 5.5.2. Integrated Services Digital Networks (ISDNs):

- The ISDN is a digital communication network that uses the public telephone network and allows users to transmit data, voice, text, and video communication in digital form over telephone lines. So it is called a digital network.
- It eliminates the need for a modem to convert analog signals into digital signals and vice versa.
- It does not require any rewiring. It uses the coaxial or fiber optic cables,
- It promotes uniformity and standardisation through a set of standard interfaces.
- The basic building block of ISDN is a 64 kbps (thousands bits per second) channel, referred to as a B-channel.
- Each B-channel is used to transmit user information.
- Another channel called the D-channel, carries signaling and control information used to initiate, redirect, or terminate calls.
- ISDN works basically on five principles:
  - ✓ Openness;
  - ✓ Modularity;
  - ✓ Communication based intelligence;
  - ✓ Network management and control;
  - ✓ Integrated products and services;
- **Openness:** It means that all ISDN products will be standardised. This brings order and uniformity to the complex task of developing a network.

- **Modularity:** It enables the organisation to upgrade or replace any part in a network without replacing the entire network.
- **Communication based intelligence:** It provides users with a way to configure their network connections to meet their requirements.
- **Network management and control:** It is one of the complex and challenging tasks that information system managers face.
- **Integrated products and services:** It allows the use of wide variety of products and services on the network such as voice networking, data networking, teleconferencing, etc. Recent computerised railway reservation network throughout the country is one of the examples of ISDN.

### 5.5.3. Local Area Networks (LANS)

- A local area network (LAN) is a group of computers and associated devices that share a common communications line or wireless link.
- It is connected devices share the resources of a single processor or server within a small geographic area (for example, within an office building).
- The server has applications and data storage that are shared in common by multiple computer users.
- A local area network may serve as few as two or three users (for example, in a home network) or as many as thousands of users (for example, in an FDDI network).
- Major local area network technologies are: Ethernet, Token Ring, and FDDI.
- Ethernet is the most commonly used LAN technology.
- A number of corporations use the Token Ring technology.
- FDDI is sometimes used as a backbone LAN interconnecting Ethernet or Token Ring LANs.
- Another LAN technology, ARCNET, once the most commonly installed LAN technology, is still used in the industrial automation industry.
- A suite of application programs can be kept on the LAN server.
- Users who need an application frequently can download it once and then run it from their local hard disk.
- Users can order printing and other services as needed through applications run on the LAN server.
- A user can share files with others at the LAN server; read and write access is maintained by a LAN administrator.
- A LAN server may also be used as a Web server if safeguards are taken to secure internal applications and data from outside access.

### 5.5.4. Wide Area Networks (WANS)

- It is a collection of computers and network resources connected via a network over a geographic area.
- Wide-Area Networks are commonly connected either through the Internet or special arrangements made with phone companies or other service providers.



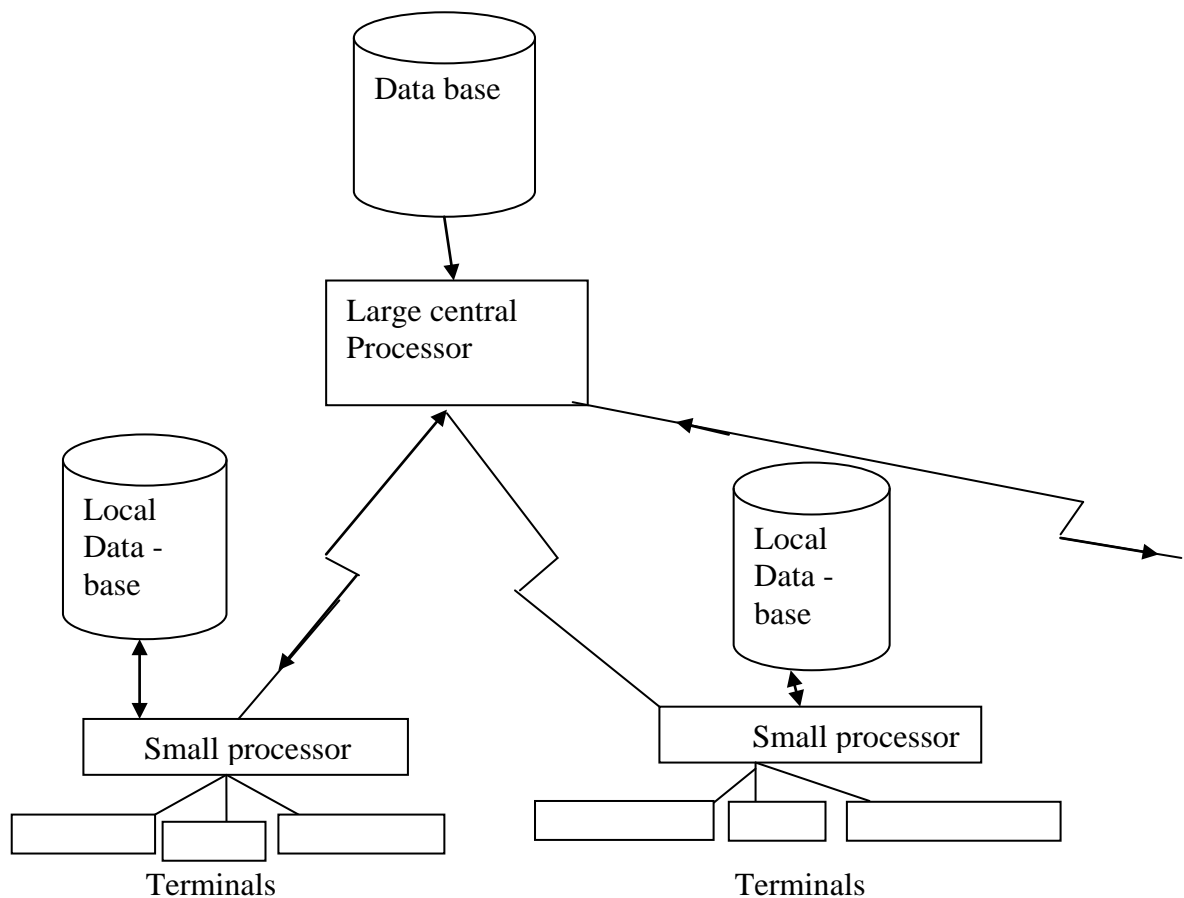
- A WAN is different from a MAN because of the distance between each of the networks. In a WAN, one network may be anywhere from several hundred miles away, to across the globe in a different country.
- There are different types of set up a WAN are:-direct distance dialling (DDD), Wide area telephone service lines (WATS), leased lines and satellites.
- Example:-banking networks, airline reservation systems and railway reservation systems.

### 5.5.5. Value Added Networks (VANS)

- The public data networks that add value to the basic communication services provided by common carriers by offering specialised services are termed as value added networks.
- The specialized services include access to commercial databases and software, correction of transmission errors, providing compatibility between incompatible computers and terminals, Email, and video conferencing.
- A subscriber to a VAN service pays monthly fee depending on its level of use.

## 5.6. DISTRIBUTED SYSTEMS

- When small computers became popular, organizations changed their strategy and began distributing the minis and micros throughout the organisation. When these systems are interconnected, the technique is known as distributed systems.



**Fig: Distributed Data Processing**

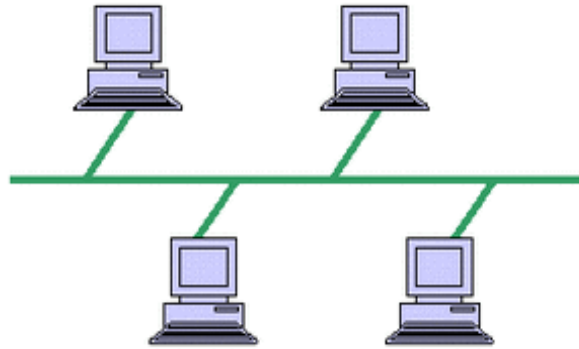
- There are a number of variations of distributed systems depending on the distribution of hardware and data:
  - Separate computer system in each location
    - Each system has its own data
    - Systems share data
    - Systems share data managed by designed by a designated computer
  - Central computer with
    - Devices in other locations connected to central computer
    - Data preparation and data entry equipment at other locations.
- When physically separated computers are interconnected through communications facilities the configuration is called distributed computing.
- Alternatively there may be a ring structure of minicomputers of equal power and no large central processor. Each minicomputer does local processing and access data from the other locations as required.
- The way a distributed processing system is configured usually depends on the needs of the application.
- Advantages of distributed computing over a centralized computer. Since the bulk of computing is performed at the local site, communication costs can be considerably reduced.
- Also if one processor does function its processing can be shifted to other processors and there is minimal disturbance to the entire system.

## 5.7. TOPOLOGY OF COMPUTER NETWORK

- Topology is a usually schematic description of the arrangement of a network, including its nodes and connecting lines.
- There are two ways of defining network geometry: the physical topology and the logical (or signal) topology.
- The physical topology of a network is the actual geometric layout of workstations.
- There are several common physical topologies are:

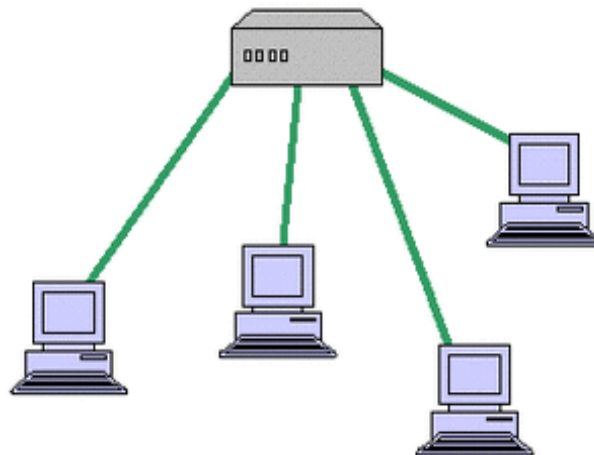
### ▪ Bus Topology:

In the bus network topology, every workstation is connected to a main cable called the bus. Therefore, in effect, each workstation is directly connected to every other workstation in the network.

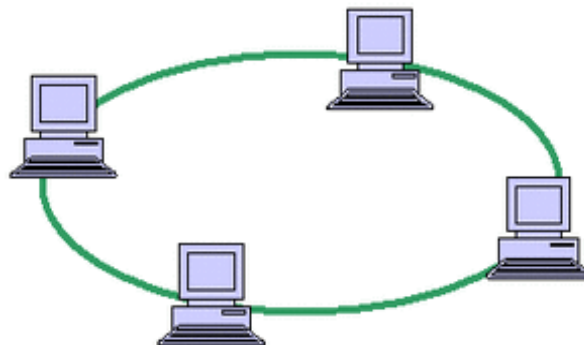


- **Star Topology:**

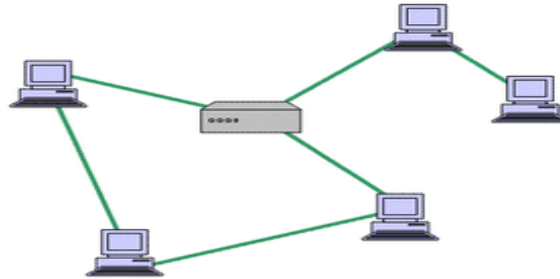
In the star network topology, there is a central computer or server to which all the workstations are directly connected. Every workstation is indirectly connected to every other through the central computer called hub



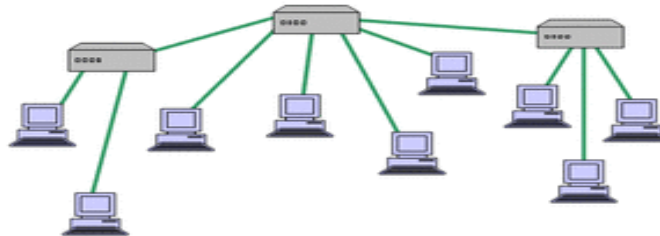
- **Ring Topology:** In the ring network topology, the workstations are connected in a closed loop configuration. Adjacent pairs of workstations are directly connected. Other pairs of workstations are indirectly connected, the data passing through one or more intermediate nodes. If a Token Ring protocol is used in a star or ring topology, the signal travels in only one direction.



- **Mesh Topology:** The mesh network topology employs either of two schemes, called full mesh and partial mesh. In the full mesh topology, each workstation is connected directly to each of the others. In the partial mesh topology, some workstations are connected to all the others, and some are connected only to those other nodes with which they exchange the most data.



- **Tree Topology:** The tree network topology uses two or more star networks connected together. The central computers of the star networks are connected to a main bus. Thus, a tree network is a bus network of star networks.



## 5.8. PROTOCOLS AND NETWORK ARCHITECTURE

### ❖ Protocol

- When two devices are communicating, there must be agreement as to the meaning of control information being sent with the data and agreement as to the control information and data shall be packaged.
- Thus protocols are the rules and formats that ensure efficient and error free electronic communication.
- A protocol has three major components a set of characters having same meaning to the sender and to the receiver a set of rules for timing and sequencing messages and a set of methods for detecting and correcting errors.
- Some popular protocols are TCP/IP, systems network architecture system application architecture (SAA), XMODEM, YMODEM and Kermit.

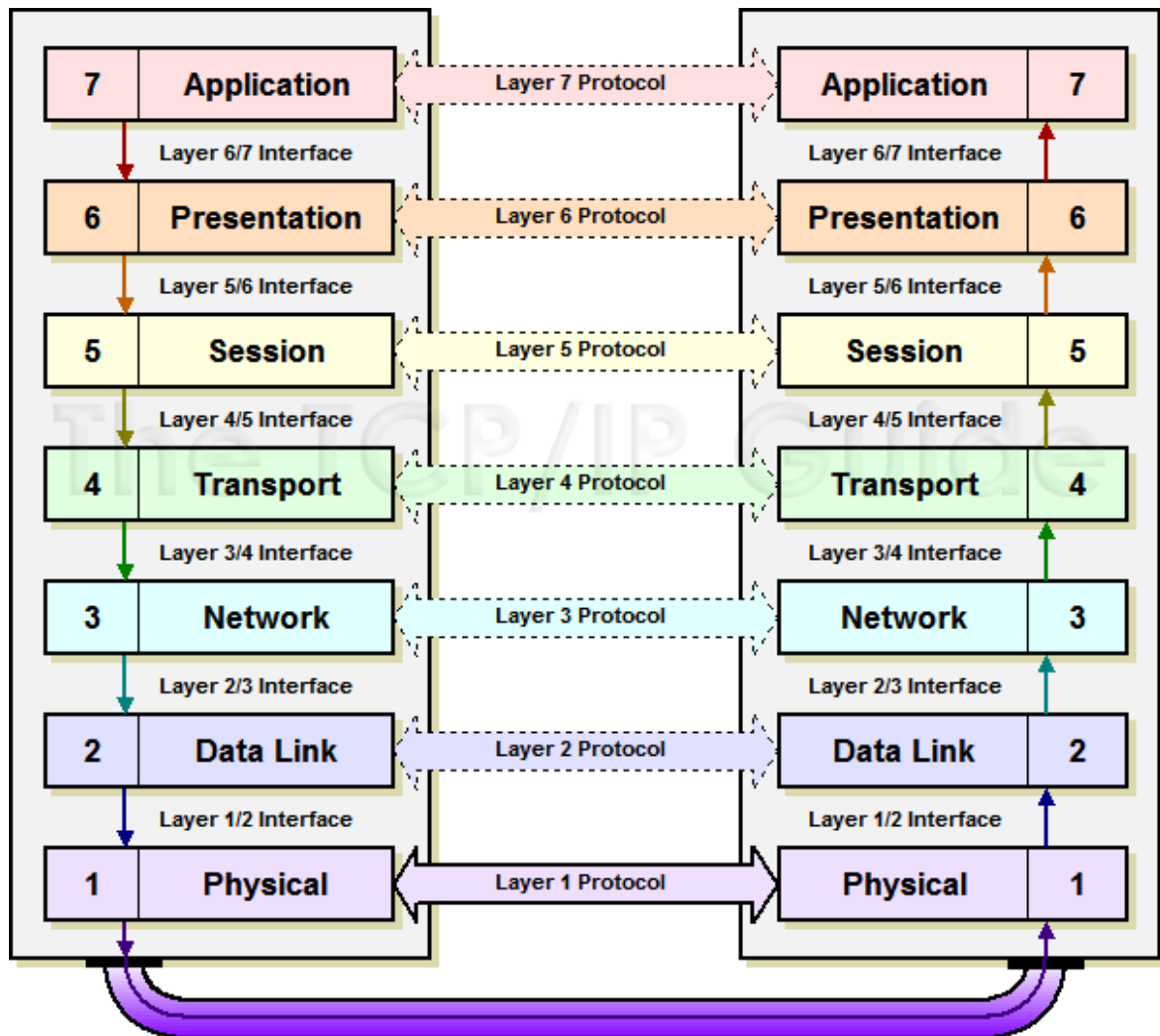
### ❖ Network Architecture

- Network architecture is a set of standards, or protocols, for telecommunication hardware and software.
- It is intended to maximize modularity, user friendliness, reliability, and ease of network maintenance.
- It must establish standards for all its elements, the hardware, the software and the user interface.

- The simple network management protocol is popular network architecture.

## 5.9. OPEN SYSTEM INTERCONNECTION (OSI)

- The problem on incompatibility between data communication products affected users on a worldwide basis, and the international standards organisation in 1978, developed a system of network protocols and named it the OSI model.
- It is a model that allows any two different computers can communicate with each other without paying attention on their architecture.
- The purpose of this model is to open the communication between un-related systems. It means the OSI model allows communication between two different computers without requiring changes to the logic of the underline hardware and software used in the computers.
- The OSI model is not a protocol it is model for understanding and designing network architecture i.e. flexible or robust.
- The seven layers of the OSI model are:-
  - Physical layer
  - Data link layer
  - Network layer
  - Transport layer
  - Session layer
  - Presentation layer
  - Application layer
- **Physical layer:** Transmits the data from one node to another node.
- **Data link layer:** Formats the data into a record called a frame and performs error detection.
- **Network layer:** It causes the physical layer to transfer the frames from node to node.
- **Transport layer:** It enables the user and host nodes to communicate with each other. It also synchronises fast and slow-speed equipment as well as overburdened and idle units.
- **Session layer:** It initiates, maintains, and terminates each session. A session consists of all the frames that compose a particular activity, plus signals that identify the beginning and end. A session is like a telephone call that begins with “hello” and ends with “good bye”. Standard log on and user identification routines are used to initiate data communication sessions.
- **Presentation layer:** Formats the data for presentation to the user or the host.
- **Application layer:** It controls user input from the terminals and executes the users application program in the host.
- The bottom three layers appear in all nodes, but the upper four layers appear in only the host and user nodes.
- Layer 1 is the only layer that physically exists.
- The other layers use the physical layer use the physical layer for transmission of their signals.



### 5.10. NETWORK MANAGEMENT:

Networks are the nervous system of the organizations operations, and failure can cost corers of rupees every minute if the network is out service. Network management aimed at reducing the opportunity for network failures, primarily through **planning and control**.

#### ➤ Network planning

It consists of all the activity aimed at anticipating the organizations network needs. It includes three main components-**Capacity planning, staff planning, and performance monitoring**.

- **Capacity planning:** it analyses and plans for traffic volumes that the network can handle.
- **Staff planning:** It helps determine the number of persons necessary to manage a network and their required level of expertise.
- **Performance monitoring:** It includes analysing response times for a given level of traffic to anticipate the effects of potential changes in network performance.

#### ➤ Network control

It involves the day to day monitoring of the network to ensure that is maintains the desired level of operations. It includes procedures such as fault detection, fault isolation, and network

restoration. Ideal network control systems alert the operator to network failures or operational failures, identify the troubled components and help correct the problem. To achieve and maintain network control, organisation need operation standards, design strategies, failure control procedures, and problem solving methodologies. These control elements should be updated as changes occur in computing technology the network or the organisation.

➤ **Network manager**

It is responsible for planning, implementing and controlling the organisation data communication network.

Main functions of network management are:

- Establish lines of communication among different network administrators
- Develop standards throughout the organisation for the use of network resources and applications.
- Establish corporate security policies that ensure that : (a) critical or proprietary data are well protected; (b) network configuration is carefully documented, (c) distributed to all network managers, (d) updated frequently.
- Established backup procedures for all corporate data and strictly enforce backup policies.
- Eliminate or at least reduce redundancies in firm's data bases.

➤ **Electronic Data Interchange(EDI)**

It is a direct computer to computer exchange of data over a telecommunications network, thus eliminating the need for retyping data. Although EDI has been around for a long time, in recent years, many organizations are using EDI as a way to reduce processing errors and cut operating costs. Costs associated with EDI are software, hardware, VAN changes, software interface, program maintenance, and process reengineering. EDI is a powerful technology because it can create meaningful partnerships and replace sluggish bureaucracies with responsive organizations.

# CHAPTER-6

## DATABASE MANAGEMENT TECHNOLOGY

### 6.1. INTRODUCTION

**Database:** It is an integrated collection of logically organised data to manage an organisation. It includes transient data such as input documents, reports and results obtained during processing.

### 6.2. DATA AND INFORMATION

- **Data:** Data is distinct pieces of information. It is formatted in a special way. All software is divided into two general categories: *data* and *programs*. Programs are collections of instructions for manipulating data. Data can exist in a variety of forms as numbers or text on pieces of paper, as bits and bytes stored in electronic memory
- **Information:** When data are processed they become information only when they are presented to the decision maker in a meaningful manner.

### 6.3. DATA HIERARCHY

- The data in a computer system are organized in a hierarchy known as the data hierarchy chain. The hierarchy in ascending order bits, bytes, fields, records, files and database.
- Hence a database is made up of records, records consist of fields, fields contain bytes, and bytes are made up of bits.
- **Bit:** A bit is a value that represents the presence or absence of an electronic signal and is represented as a 1 or 0.
- **Byte:** Eight bits make up a byte and a byte is required to represent a character (number, alphabetic and so on) in a computer.

Ex: Six bytes are required to represent the name Pragya in a computer. Since each character represented using 8 bits, the name Pragya required 48 bits.

- **Field:** A meaningful group of characters or bytes is referred to as a field. For example Pragya's last name, first name and phone no. are 3 fields.
- **Record:** it is a group of interrelated fields is called a record. For example thus Pragya's last name, first name and phone no., identity no. and home address can make up a record.
- **File:** It is a collection of interrelated records
- **Database:** It is an integrated repository of logically related data that facilitate easy access and processing of data is called a database.



### Credit Card Database

Database

Personal Data File	Credit History File	Transaction Data File
--------------------	---------------------	-----------------------

File

Last Name	First Name	Address	Phone	Social Security No.
Gupta	Udit	188A/238 Lake gardens Calcutta-700045	033-4177861	19-00003466

Record

Gupta	Udit	188A/238 Lake Gardens Calcutta-700045	033-4177861	19-00003466
-------	------	---	-------------	-------------

Field

Gupta (Last name)  
 Udit (First name)  
 188A/238, Lake gardens, Calcutta-700045(Address)  
 033-4177861(phone no.)  
 19-00003466 (Social security no.)

Byte

U	d	i	t
---	---	---	---

Bit

0 or 1

**Fig: A Database Hierarchy for a Credit Card Company**

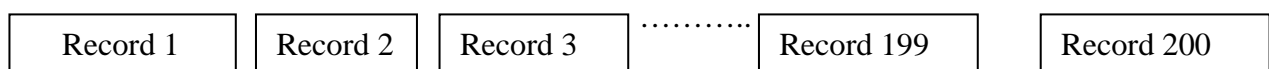
## 6.4. METHODS FOR ORGANISING DATA IN FILES

A number of methods are available to organized data in files. The choice of the method is based on the factors such as storage media, access methods, processing techniques etc. There are three types method for organizing data in files. These are:

1. Sequential File Organisation.
2. Indexed-sequential File Organisation.
3. Direct File Organisation

### 6.4.1. Sequential File Organisation

- In sequential File organisation records are physically stored in a specified order according to a key field in each record.
- In sequential file organization records are written and stored on a secondary storage device in the same sequence in which they were collected.
- It is necessary that data sequencing and ordering must be done before the file is created, because the ordering of data cannot be changed when the file is processed.
- When records are modified the entire file must be rearranged.
- Example If one desires to retrieve record 199 out of 200 records one through 198 must be read first.



**Fig: Sequential File Organisation**

- It is suitable to batch processing application such as pay roll.
- This method is too slow to handle applications requiring immediate updating or responses.

### 6.4.2. Direct File Organisation

- Direct file organisation provides the fastest direct access to records.
- When using direct access methods, records do not have to be arranged in any particular sequence on storage media.
- A unique is used to organize files, which are converted directly to a memory address using a mathematical formula called a hashing algorithm.
- Example the magnetic disk is ideally suited and many applications today use some form of direct file organisation. It is suited to quickly retrieve a single record the computer goes directly to record 199 and the hashing algorithm identified the secondary storage address.

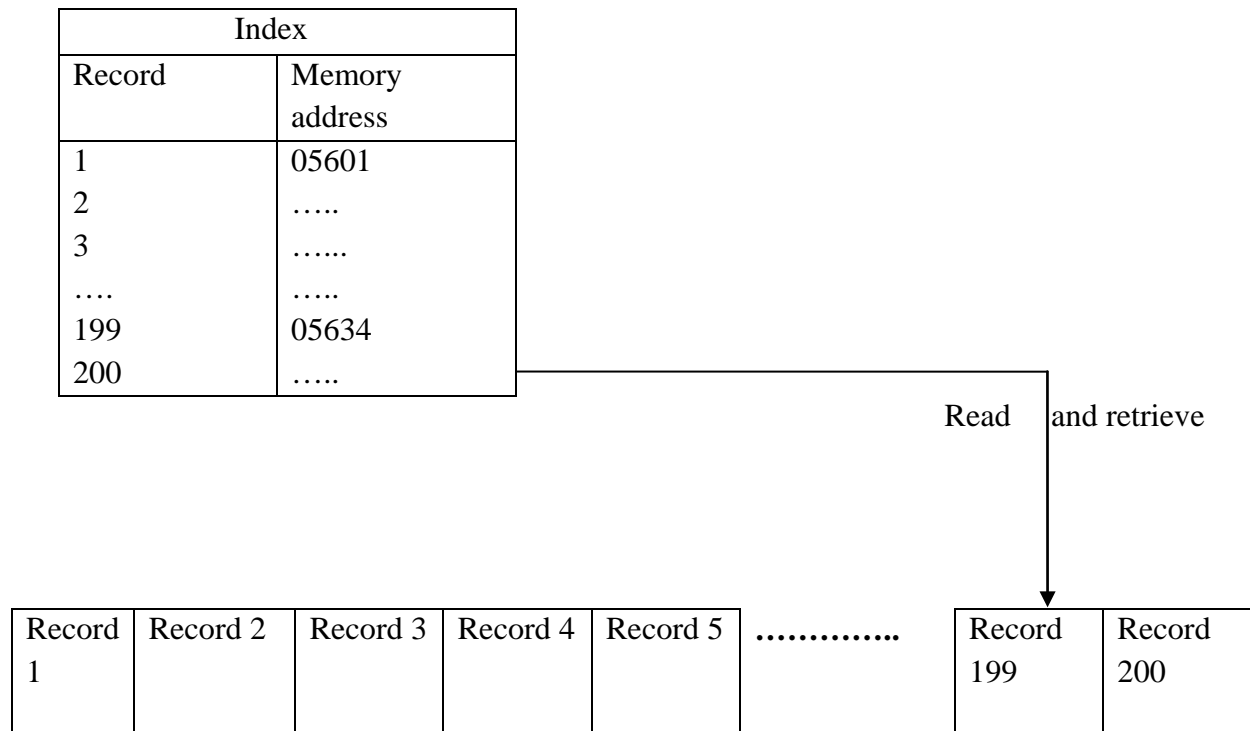


**Fig: Direct File Organisation**

### 6.4.3. Indexed-Sequential File Organisation

- In this method data are stored in a sequence (a sequential method) but an index is created which show the memory address of each data.
- A file index shows the memory address or physical location of each data, making it easier and quicker to access data.

- Here the computer goes directly to record 199. It refers to an index to locate the memory address for record 199 and retrieves it from that address.



**Fig: Indexed sequential File Organisation**

## 6.5. LIMITATIONS OF FILE BASED SYSTEMS

- Data were stored and processed using file processing systems.
- Each file is independent of other files, and data in different files can be integrated only by writing individual program for each application.
- The data are so arranged that any change to the data requires changing all the programs that uses the data.
- This is because each file is 'hard-coded' with specific information such as data type, data length, and so on.
- Many times it is even difficult to identify all the programs using that data. Therefore, this is often done on a trial and error basis.

The main disadvantages of the file based system is

- Data redundancy
- Data integrity
- Data availability
- Management control

## 6.6. DATABASE AND DATABASE MANAGEMENT SYSTEMS

### Database:

It is an integrated collection of logically organised data to manage an organisation. It excludes transient data such as input document, reports and intermediate results obtained during

processing. A database models the data resource of an organization using the relationships between different data items. Database systems require the use of direct access storage devices.

### **Database management systems (DBMS)**

A database management system (DBMS) is a collection of programs that enables you to store, modify, and extract information from a database. There are many different types of DBMSs, ranging from small systems that run on personal computers to huge systems that run on mainframes. The DBMS acts as an interface between the application program and the data in the database. The following are examples of database applications:

- ☐ Computerized library systems
- ☐ Automated teller machines
- ☐ Flight reservation systems
- ☐ Computerized parts inventory systems

### **6.6.1. Advantages of database**

- Control redundancy
- Relating data items
- Data integrating
- Database performance
- Data security
- Management controls

### **6.6.2. Disadvantage**

- It requires considerable outlay of resources.
- Main frame hardware is expensive and although today there are a number of PC based database, multiple copies of the software, combined with training, can become an expensive proposition.

### **6.6.3. Data management**

The data management activities include:

- **Data integrity:** The necessary data is collected and recorded on a form called a source document that serves as input to the system. For example data, describing a sale is entered on a sales order form.
- **Integrity and verification:** The data is examined to assure its consistency and accuracy based on prescribed constraints and rules.
- **Storage:** The data is stored on some medium such as magnetic tape or magnetic disk.
- **Maintenance:** New data is added, existing data is changed and data no longer needed is deleted for keeping the data resource current.
- **Security:** The data is safeguarded to prevent destruction, damage, or misuse.
- **Organisation:** The data is arranged in such a way to meet the information needs to users.
- **Retrieval:** The data is made available to users.

### 6.6.4. Differences between databases and traditional files

- It is to be seen here why the location of data has to be specified in a file processing environment, where a database automatically retrieves the data. The main reason for this difference is that in DBMS the logical and physical views of the data are separate, where as in a file processing environment the logical and physical views of the data are firmly interwoven.
- The **logical** view of data presents the logical relationship between different data elements in a database the physical view shows how the data are physically stored in storage medium. The managerial personnel are concerned only with the logical relationship between data.
- A **data base schema** is a logical description of each piece of data and its relationship with other elements. It does not identify the actual value of data. For example the database schema might include such employee files as retirement, health insurance, or employment test results.
- A **subschema** is a subset of the field and records in a schema. Subschemas provide a user oriented view of the data base. When the user defines the schemas and subschemas, they are automatically generated by the DBMS. Schema and subschema's increase the efficiency of database and make more user friendly than traditional files.

### 6.6.5. Components of a DBMS

There are main components. These are

- Data Dictionary System(DDS)
- Data Definition Language(DDL)
- Data Manipulation Language(DML)

#### ❖ DATA DICTIONARY SYSTEM (DDS)

A data dictionary is a file or a set of files that contains a database's metadata. The data dictionary contains records about other objects in the database, such as data ownership, data relationships to other objects, and other data. The data dictionary is a crucial component of any relational database. Because of its importance; it is invisible to most database users. Typically, only database administrators interact with the data dictionary.

#### ❖ DATA DEFINITION LANGUAGE (DDL)

The Data Definition Language (DDL) is used to create and destroy databases and database objects. These commands will primarily be used by database administrators during the setup and removal phases of a database project. Data Definition Language (DDL) is a standard for commands that define the different structures in a database. DDL statements create, modify, and remove database objects such as tables, indexes, and users. Common DDL statements are CREATE, ALTER, and DROP.

### ❖ **Data Manipulation Language (DML)**

The Data Manipulation Language (DML) is used to retrieve, insert and modify database information. These commands will be used by all database users during the routine operation of the database. The Data Manipulation Language (DML) is used to retrieve, insert and modify database information. These commands will be used by all database users during the routine operation of the database.

### ❖ **STRUCTURE QUERY LANGUAGE**

Structured Query Language (SQL) is a standard computer language for relational database management and data manipulation. SQL is used to query, insert, update and modify data. Most relational databases support SQL, which is an added benefit for database administrators (DBAs), as they are often required to support databases across several different platforms.

First developed in the early 1970s at IBM by Raymond Boyce and Donald Chamberlin, SQL was commercially released by Relational Software Inc. (now known as Oracle Corporation) in 1979. The current standard SQL version is voluntary, vendor-compliant and monitored by the American National Standards Institute (ANSI). Most major vendors also have proprietary versions that are incorporated and built on ANSI SQL, e.g., SQL\*Plus (Oracle), and Transact-SQL (T-SQL) (Microsoft).

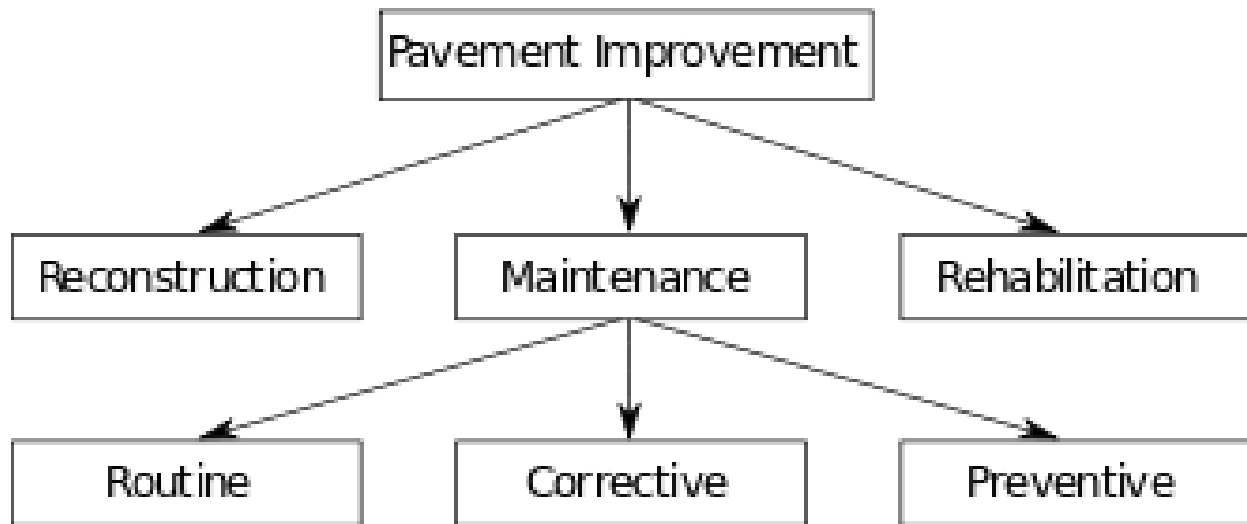
## **6.6.6. Database Models**

A database model is the method of organising data and represents the logical relationships among data elements in the database. Popular database models are hierarchical models, network models and relational models.

### ❖ **Hierarchical Model**

- The hierarchical data model organizes data in a tree structure. There is a hierarchy of parent and child data segments.
- This structure implies that a record can have repeating information, generally in the child data segments.
- Data in a series of records, which have a set of field values attached to it.
- It collects all the instances of a specific record together as a record type. These record types are the equivalent of tables in the relational model, and with the individual records being the equivalent of rows.
- To create links between these record types, the hierarchical model uses Parent Child Relationships.
- These are a 1: N mapping between record types. This is done by using trees.
- For example, an organization might store information about an employee, such as name, employee number, department, salary.
- The organization might also store information about an employee's children, such as name and date of birth. The employee and children data forms a hierarchy, where the employee data represents the parent segment and the children data represents the child segment.

- If an employee has three children, then there would be three child segments associated with one employee segment. In a hierarchical database the parent-child relationship is one to many. This restricts a child segment to having only one parent segment.



**Fig: Hierarchical Model**

#### ❖ Network Model

- The popularity of the network data model coincided with the popularity of the hierarchical data model. Some data were more naturally modelled with more than one parent per child.
- So, the network model permitted the modelling of many-to-many relationships in data.
- In 1971, the Conference on Data Systems Languages (CODASYL) formally defined the network model.
- The basic data modelling construct in the network model is the set construct.
- A set consists of an owner record type, a set name, and a member record type.
- A member record type can have that role in more than one set; hence the multiparent concept is supported.
- An owner record type can also be a member or owner in another set.
- The data model is a simple network, and link and intersection record types (called junction records by IDMS) may exist, as well as sets between them.
- Thus, the complete network of relationships is represented by several pair wise sets; in each set some (one) record type is owner (at the tail of the network arrow) and one or more record types are members (at the head of the relationship arrow).
- Usually, a set defines a 1: M relationship, although 1:1 is permitted.

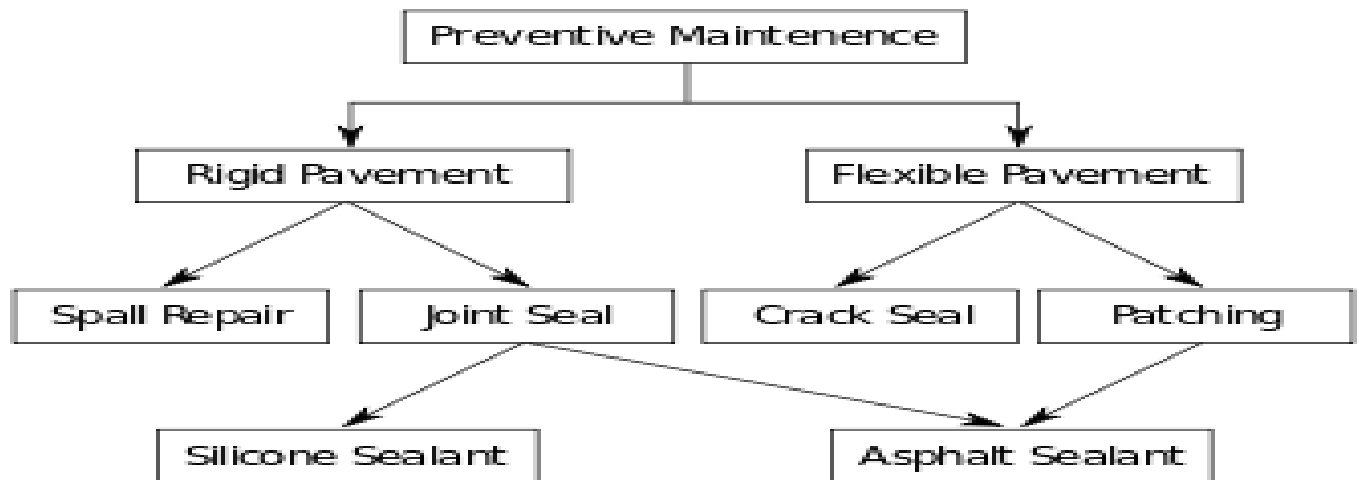


Fig: Network Model

#### ❖ Relational Model

- A database based on the relational model developed by E.F. Codd. A relational database allows the definition of data structures, storage and retrieval operations and integrity constraints.
- In such a database the data and relations between them are organised in tables.
- A table is a collection of records and each record in a table contains the same fields.
- Properties of Relational Tables:
  - ☐ Values Are Atomic.
  - ☐ Each Row is Unique.
  - ☐ Column Values Are of the Same Kind.
  - ☐ The Sequence of Columns is Insignificant.
  - ☐ The Sequence of Rows is Insignificant
  - ☐ Each Column Has a Unique Name
- Certain fields may be designated as keys, which mean that searches for specific values of that field will use indexing to speed them up.
- Where fields in two different tables take values from the same set, a join operation can be performed to select related records in the two tables by matching values in those fields. But not always, the fields will have the same name in both tables.
- For example, an "orders" table might contain (customer-ID, product-code) pairs and a "products" table might contain (product-code, price) pairs so to calculate a given customer's bill you would sum the prices of all products ordered by that customer by joining on the product-code fields of the two tables. This can be extended to joining multiple tables on multiple fields. Because these relationships are only specified at retrieval time, relational databases are classed as dynamic database management system. The RELATIONAL database model is based on the Relational Algebra



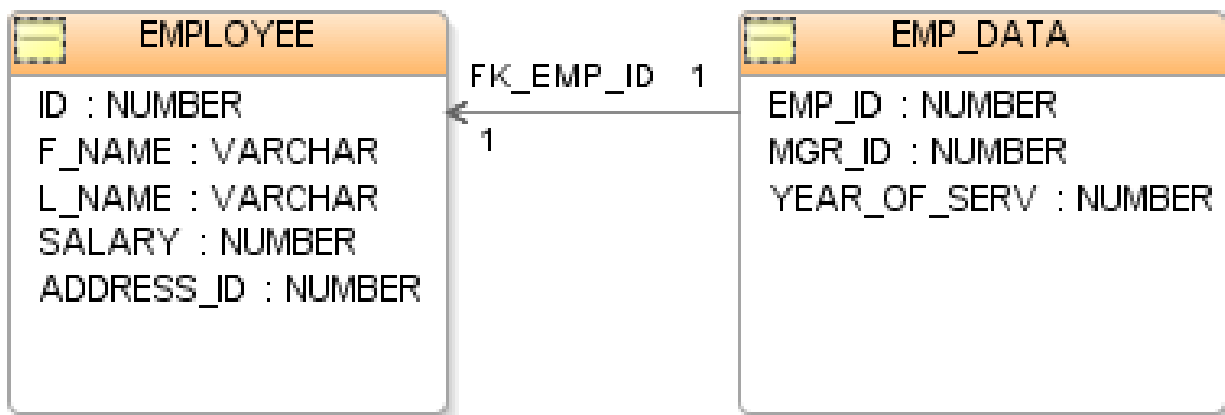
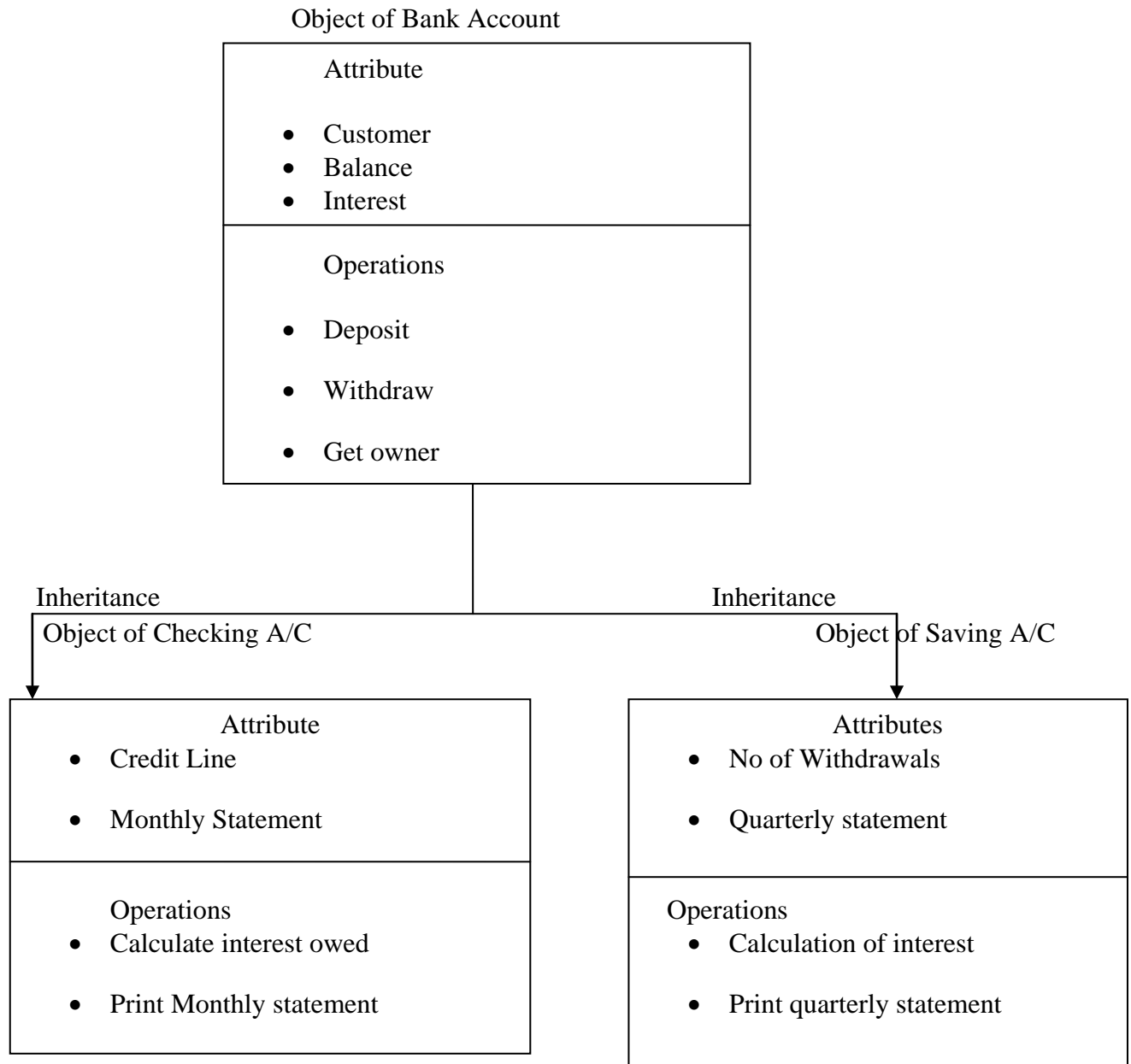


Fig: Relational Model

## 6.7. OBJECT ORIENTED DATABASE STRUCTURE

- It is the important technology of a new generation of multimedia web based application.
- An object consists of data values describing the attributes of an entity and the operation that can be performed upon the data.
- This encapsulation capability allows the object oriented model to handle more complex type of data (graphical, pictures, voice, and text) than other data base structure.
- An Example of object from the customer and bank is shown below:

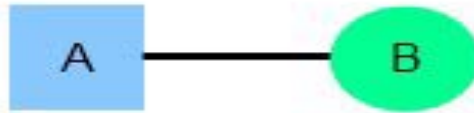


## 6.8. ERD DIAGRAM

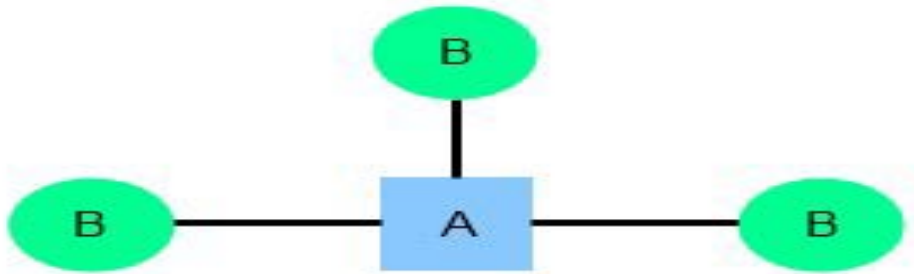
An entity-relationship (ER) diagram is a graphical representation of entities and their relationships to each other. It is used in computing in regard to the organization of data within databases or information systems. ERD uses three features to describe data: Entity, Relationships and Attributes. An entity is a piece of data an object or concept about which data is stored. A relationship is how the data is shared between entities. An attribute is an item of data that describes an entity. There are three types of relationships among entities:

**1. One-to-One (1-1)**

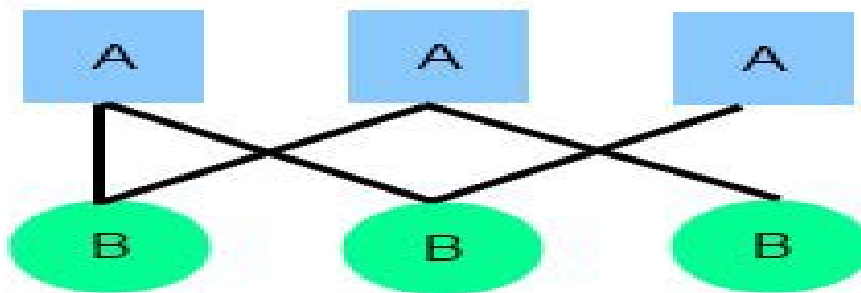
- One instance of an entity A is associated with one other instance of another entity B. For example, in a database of employees, each employee name A is associated with only one social security number B.

**2. One-to-Many (1-M)**





- One instance of an entity A is associated with zero, one or many instances of another entity B but for one instance of entity B there is only one instance of entity A.
- For example, for a company with all employees working in one building, the building name A is associated with many different employees B, but those employees all share the same singular association with entity A.

**3. Many-to-Many (M-M)**

- One instance of an entity A is associated with one, zero or many instances of another entity B, and one instance of entity B is associated with one, zero or many instances of entity A.
- For example, for a company in which all of its employees work on multiple projects, each instance of an employee A is associated with many instances of a project B and at the same time, each instance of a project B has multiple employees A associated with it.



### Symbols of E-R Model

Name	Symbols	Meaning
Rectangle		Representing Entity set
Oval		Representing attributes
Diamond		Relationship
Line		Links attributes and entity set

## 6.9. FOURTH GENERATION OF PROGRAMMING LANGUAGE

- A **fourth-generation programming language (4GL)** is a computer programming language envisioned as a refinement of the style of languages classified as third-generation programming language (3GL).
- Each of the programming language generations aims to provide a higher level of abstraction of the internal computer hardware details, making the language more programmer-friendly, powerful and versatile.
- While the definition of 4GL has changed over time, it can be typified by operating more with large collections of information at once rather than focus on just bits and bytes.
- Languages claimed to be 4GL may include support for database management, report generation, mathematical optimization, GUI development, or web development.
- Fourth-generation languages have often been compared to domain-specific languages.

## 6.10 RECENT DEVELOPMENT IN DATABASES

### 6.10.1 Distributed databases

- A distributed database is over single or multi vendor computer hardware located in different geographic areas.
- Examples are. Network of bank transaction/credit a network of libraries and a network of corporate offices across the country.
- Distributed databases have become popular in recent years because of two main applications, such as a payroll, personnel data, and employee benefits and so on.

### 6.10.2 Client server architecture

- With client server architecture a network user can initiate several client processes in many windows among many servers they could be heterogeneous hardware and software running on machines that are geographically dispersed.

### 6.10.3 Object oriented databases.

- Object oriented programming (OOP) methodology uses information hiding principles to ensure that data are processed only by the correct programs and in a correct manner.
- Also using a concept known as polymorphism, the OOP methodology permits multiple views of data in a significantly better fashion than the view mechanism of relational systems.

### 6.10.4 Multimedia databases

- Databases to handle complex data objects, like scanned images, audio and video images, are known as multimedia databases. A new generation of databases are being built accommodate multimedia.

## 6.11. PRINCIPLE OF DATABASE MANAGEMENT

- Database technology must be aligned with business strategy.
- It should be easy to access and process data residing in different databases.
- Data resources are critical to an organisation and must be fully utilized and protected.
- Control and security are important issues in databases, particularly distributed databases.
- Database tools must be carefully selected. For this following points should be taken into consideration
  - ✓ Understand the resource required
  - ✓ Understand database utilities
  - ✓ Understand SQL optimization
  - ✓ Understand connectivity issues

## 6.12. THE DATABASE ADMINISTRATOR

- A database administrator is a specialist who has responsibility for the database.
- The duties of the DBA are planning, implementation, Operation and Security.
- There are responsibilities of a DBA are:-
  - ✓ Helps an organization decide which department will be responsible for the maintenance and updates of each data field in a database.
  - ✓ Assures access to database information to each department that needs it.
  - ✓ Secures databases or portions of databases from unauthorized use.
  - ✓ Protects databases from physical harm by supervising the creation of backup copies and establishing fallback procedures.
  - ✓ Coordinates the work of individuals making file modification, policy changes and improvements to databases.

# CHAPTER-7

## CLIENT-SERVER COMPUTING

### 7.1. INTRODUCTION

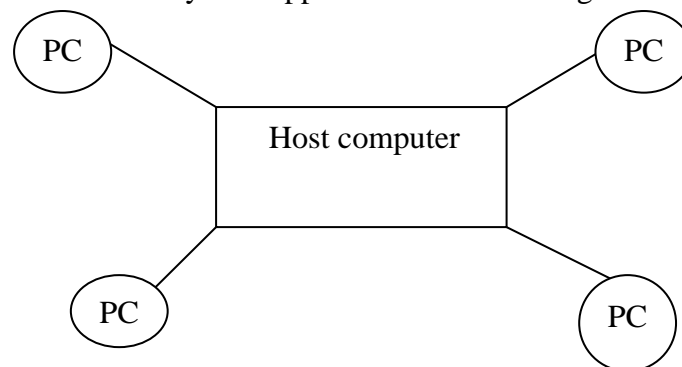
- Client-server computing is an approach to network use and is based on the concept that some functions are performed best on a local basis and some are performed on a central basis.
- Client-server computing is a blend of the time-sharing approach, which features central use, and the distributed processing approach, which emphasizes local use.
- Client-server computing can involve WANs, but the configuration typically consists of one or more interconnected LAN's.
- In a typical client-server computing network, application processing is shared between client and one or more servers.
- A client is a user who accesses the network by means of a desktop computer.
- A server can be a computer of any size – a mainframe, a mini, a workstation or even a micro – that provides a control function for the network.
- Client-server computing is a much more complex hardware and software configuration than either time-sharing or distributed processing.
- The key to client server computing is the network server software that provides control points for critical function such as hardware sharing, data sharing, database management, storing and forwarding, network management, batch processing, and the interconnection of multiple networks.

### 7.2. DEFINATION OF CLIENT-SERVER COMPUTING

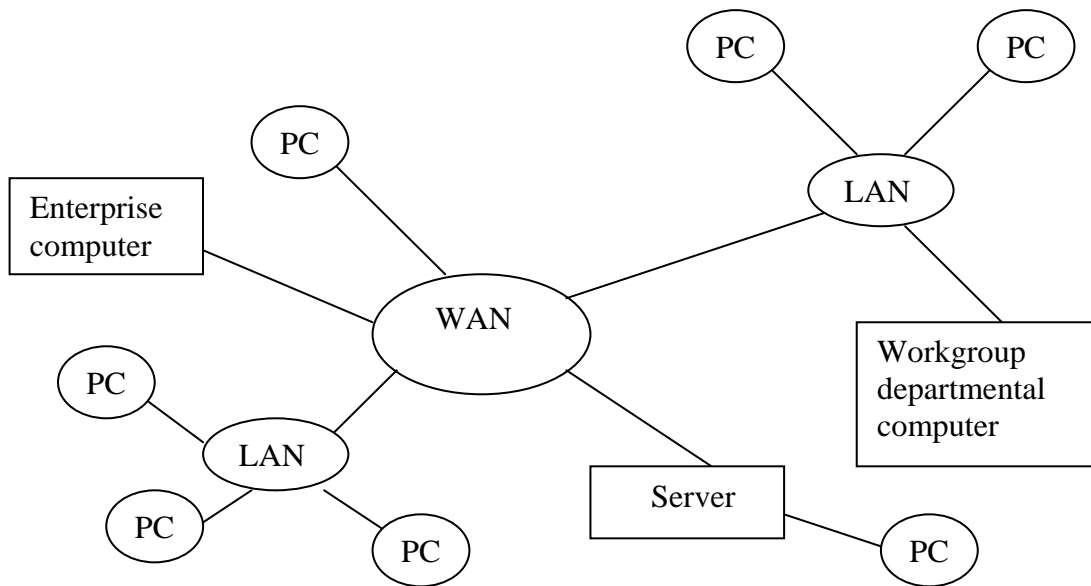
- The client-server technology is defined by Newton's telecom Dictionary is "A form of shared, or distributed, computing in which tasks and computing power are split between servers and clients. Servers store and process data common to users across the enterprise; these data can then accessed by client systems for individual processing requirements."

### 7.3. COMPONENTS AND FUNCTION OF A CLIENT SERVER SYSTEM

- It is compared with the earlier configuration with a host acting as 'master' and the connected PCs (or minis) acting as 'slaves'.
- An overview of the client server system approach as shown in fig.



Host computing with master –slave orientation

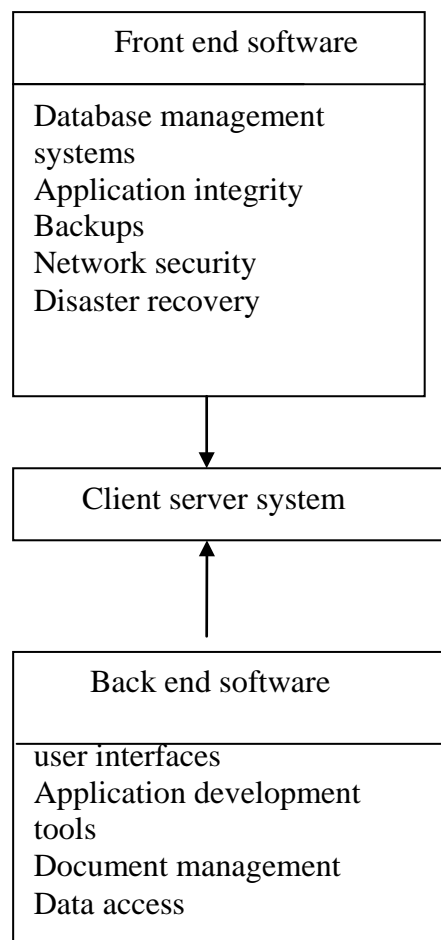


(Distributed networking with client server system)

**Fig; Host computing vs. the client server system**

- Discusses the below fig is the client server architecture, in addition to server and client software includes front-end (client) software and back-and(server) software.
- The front end software provides the user interface, communication with at least one server, and data manipulation.
- The back-end software primarily controls data acquisition and integrity, supports transaction management, and recovers lost transactions, in cases of system failure.

Other components of client software are tools for developing user interfaces, applications, communications and software to communicate with the server, document management systems, and relational database management systems (RDBMS).



**Fig: Different types of Front end and Back end software**

➤ In a client server system:-

- The server influences the way the client responds to a user request,
- A number of clients can access the server at the same time and
- Client process and server processes are independent of each other.

## 7.4. DEVELOPMENT OF CLIENT-SERVER SYSTEM

There are five steps are required before development of a client-server system:

- ✓ Identify and define the type of a application (problem definition).
- ✓ Assess network requirements.
- ✓ Select the architecture (hardware, software, and network capabilities).
- ✓ Develop the logical and physical design of the system.
- ✓ Test, implement, and maintain the system.

The development of client-server applications is then based on the following six components:

- ✓ Communication service
- ✓ Distribution services
- ✓ Application service
- ✓ Organisation-specific applications



- ✓ Industry-specific applications
- ✓ System management and security

## 7.5. CLIENT-SERVER SECURITY

- The security of client-server environments is a critical issue for network managers.
- Access privileges and application security are two issues that must be carefully addressed in order to ensure that client server environments are will secured.
- Network managers should know at all times who is on the network and what each user is doing.
- Network security is a balancing act between control and access and there are no easy answers.
- Another issue in client server environments is preserving the integrity of system applications.

## 7.6. CLIENT-SERVER COSTS COMPUTATIONS

- Client-server technology is applicable to only those organisations that have a long-term commitment to it and are willing to make a large financial investment in it.
- Estimating the cost of client-server computing is one of the most challenging tasks confronting information System Managers.
- Some of the factors that must be taken into account when computing client-server costs are hardware, Software, Peripherals, accessories, training for end-users, managers and network administrators, contract negotiations, outside consultants and various unexpected costs.

## 7.7. ADVANTAGES OF CLIENT-SERVER SYSTEM

- Reduction of responsibilities and cost overhead at centre.
- Better local cost control of operations and development (original and modifications).
- Faster response time to requests for processing.
- Greater access to corporate data and knowledge otherwise maintained in a highly protected and centralised data structure. The client-server system strips data off transactional systems and stores it in the server to be shared for analysis and even local manipulation
- Enable distribution of processing from centralised to desktop computing.
- Offers co-operative processing between individuals and group departments across organisation boundaries, geographies and time zones
- Rewriting system for the client server system is often an opportunity to purge obsolete software from the application portfolio and to consolidate, integrate and make the system more efficient.
- Offers more friendly interfaces for end-users – especially knowledge workers and customers.
- Greater involvement of end-users in IT implementations.
- The open architecture and open systems offer flexibility in choosing different configurations of hardware, networks, and DBMS from multiple vendors.
- There is greater possibility for expansion by adding hardware (even laptop computers) to networks without replacing existing hardware. The plug-and-play possibility applies (at least in theory when parts of a system can be replaced without impact on the rest of the system.

## 7.8. DISADVANTAGES/OBSTACLES OF A CLIENT-SERVER SYSTEM

Disadvantages of a client-server system are as follows:

- **organizational**
  - ✓ Lack of personal skill in the client-server system and in networking
  - ✓ Resistance to change and new technology
  - ✓ Risks of downsizing.
  - ✓ costs of conversion
  - ✓ Need for greater coordination and control of more end-users.
- **technological**
  - ✓ Need of LAN/WAN infrastructure
  - ✓ Lack o skills and equipment resources
  - ✓ Lack of methodology/experience in planning for a client-server system
  - ✓ Lack of client-server products and tools of development
  - ✓ Lack of client server applications
  - ✓ Lack of national and international standards for the client-server paradigm.

## CHAPTER-8

### DECISION SUPPORT SYSTEM

#### 8.1. INTRODUCTION

- Decision support system (DSS) is an outcome of management information system, providing support for management at operational control, management control, and strategic planning.
- Management activity of each of these classes includes planning, control, and decision making.
- A feature of the DSS that is currently receiving much publicity is computer graphics. Graphs are good only in certain situations. However, in those situations some graphs are more effective than others.
- The most recent embellishment of the DSS concept is the group decision support system (GDSS). The GDSS endeavours to improve communication among group members by providing a simulating environment.

#### 8.2. DEFINITIONS

- The term decision support system refers to a class of system which supports the process of making decisions. The emphasis is on 'support' rather than on automation of decision.
- DSS allows the decision maker to retrieve data and test alternative solutions during the process of problem-solving.

Keen and Scott Morton (1978) defined DSS as:

- The impact is on decisions in which there is sufficient structure for computer and analytic aids to be of value but where manager's judgement is essential;
- The payoff is in extending the range and capability of manager's decision processes to help them improve their effectiveness; and
- The relevance for managers is the creation of a supportive tool, under their own control, which does not attempt to automate the decision process, predefine objectives, or impose solution.

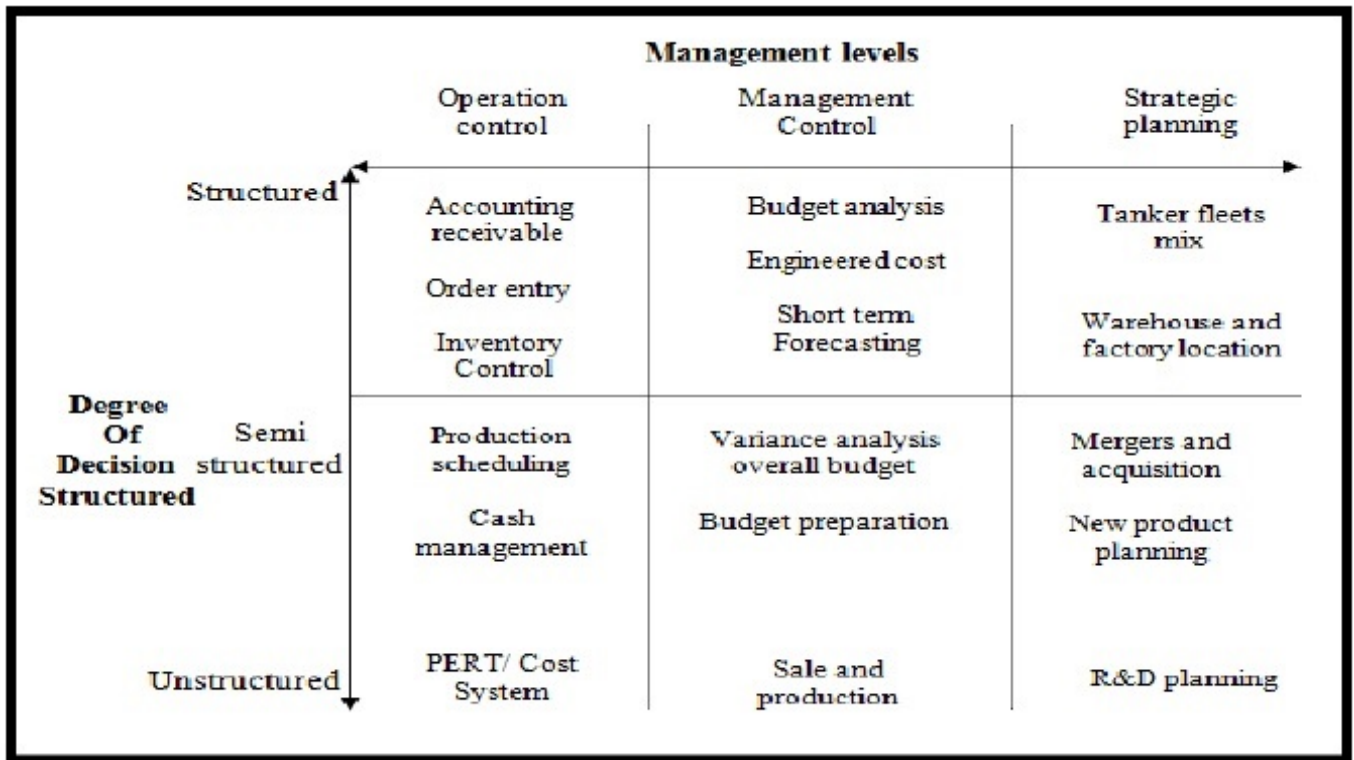
However, this definition has certain limitations.

In 1984, Freytenfeld (1984) proposed the following empirical definition of DSS based on discussions with some 30 supplier users and academic organisations:

- "A Decision support system is an interactive data processing and display system which is used to assist in a concurrent decision making process, and which also conforms to the following characteristics:
- It is sufficiently user-friendly to be used by decision makers(s) in person;
- It displays its information in a format and terminology which is familiar to the user(s); and
- It is selective in its provision of information and avoids its user(s) information overload."
- Another definition of a decision support system is: "A set of well-integrated, user-friendly, computer-based tools that combine data with various decision-making models—quantitative and qualitative—to solve semi-structured and unstructured problems."

### 8.3. EVOLUTION OF DSS:

- The notion of decision support as a formal concept was coined by G. Anthony Gorry and Michael S. Scott Morton. They felt a need for a frame work to channel computer application towards management decision making and developed a grid, known as the Gorry and Scott Morton grid.
- The grid each based on Simon's concept of programmed and non-programmed decision and Robert N. Anthony's management levels.
- The decision types are described in terms of problems structure, ranging from structured to semi-structured to unstructured.
- A fully structured problem is one in which the first three of Simon's phases – intelligence, design and choice-are structured. The decisions are routine and straightforward. By following a setup pre-established step, a solution to the problem can be found. Such a problem does not require intuition or judgement. Therefore, the system returns the same solution every time.
- An unstructured problem is one in which none of the three phases is structured. The decisions are unique and non--repetitive. Because they require intuition, experience judgement, there may be no one 'best' solution and solutions may differ from one decision maker to the other.
- A semi-structured problem is one in which one or two of the phases are structured. The decision in this category fall somewhere between structured decisions, which are routine and repetitive, and unstructured decision, which are unique and non-repetitive.
- Gorry and Scott Morton entered types of business problem into their grid. For example, accounts receivable is solved by managers on the operational-control level making structured decision. R&D planning is accomplished by strategic planning managers making unstructured decisions.
- The horizontal dotted line through the middle of the grid is significant. Its separate the problem that had been successfully solved with computer assistance from those problems that had not been subjected to computer processing.
- The upper area was named structured *decision system* and the lower area was named decision support systems.



- DSS are especially useful for semi-structured problems where problem-solving is improved by interaction between the managers and the computer system.
- The emphasis is on small, simple models which can easily be understood and used by the decision maker.
- Examples of semi-structured decision are : planning a mix of investments for a portfolio, looking at the financial implication of various way of financing a short-term cash flow deficit, consideration of alternative production and pricing policies, assessing the impact of potential future changes in exogenous variables such as interest rates, analysis of the credit-worthiness of corporate clients, and assessing the likely impacts of departmental reorganisation

#### 8.4. OBJECTIVES OF DSS

- Assist managers in making decisions to solve semi-structured problems.
- Support the manager's judgement rather try to replace it.
- Improve the manager's decision-making effectiveness rather than its efficiency.
- These objectives correlate with three fundamental principles of the DSS concept-problem structure, decision support, and decision effectiveness.

#### 8.5. CLASSIFICATION OF DSS

- ❖ **File Drawer Systems:** This is a system which provides the user with organized information regarding specific demands. This system provides on-line information. This is very useful system for decision making.
- ❖ **Data Analysis Systems:** These decision systems are based on comparative analysis and makes use of a formula. The cash flow analysis, inventory analysis and personnel inventory

systems are examples of the analysis systems. This use of simple data processing tools and business rules are required to develop that system.

- ❖ **Information Analysis System:** In this system the data is analysed and the information reports are generated. The decision makers use these reports for assessment of the situation for decision-making. The sales analysis, accounts receivables system, market research analysis are examples of such systems
- ❖ **Accounting Systems:** These systems are not necessarily required for decision making but they are desirable to keep track of the major aspects of the business. These systems account items such as cash, inventory, and personnel and so on.
- ❖ **Model Based Systems:** These systems are simulation models or optimization models for decision making. It provides guidelines for operation or management. The product decision mix decisions, material mix, job scheduling rules are the examples. It is the most important type of DSS.
- ❖ **Solver Oriented DSS:** It is performing certain computations for solving a particular type of problem. The solver could be economic order quantity procedure for calculating an optimal ordering quantity.
- ❖ **Suggestion System:** There are used for operational purposes. They give suggestion to the management for a particular problem. This model helps in making required collection of data before taking a suitable decision.

## 8.6. CHARACTERISTICS OF DECISION SUPPORT SYSTEM (DSS)

1. DSS tends to be aimed at the less well structured, underspecified problem that upper level managers typically face;
2. DSS attempts to combine the use of models or analytic techniques with traditional data access and retrieval functions;
3. DSS specifically focuses on features which make them easy to use by non computer people in an interactive mode; and
4. DSS emphasizes flexibility and adaptability to accommodate changes in the environment and the decision making approach of the user.

## 8.7. COMPONENTS OF A DSS

Following are the components of the Decision Support System:

### 8.7.1. Database Management System (DBMS)

- ➔ To solve a problem the necessary data may come from internal or external database.
- ➔ In an organization, internal data are generated by a system such as TPS and MIS.
- ➔ External data come from a variety of sources such as newspapers, online data services, databases (financial, marketing, human resources).

### 8.7.2. Model Management system

- ➔ It stores and accesses models that managers use to make decisions.

- ➔ Such models are used for designing manufacturing facility, analyzing the financial health of an organization. Forecasting demand of a product or service etc.

### 8.7.3. Support Tools

- ➔ Support tools like online help; pull down menus, user interfaces, graphical analysis, error correction mechanism, facilitates the user interactions with the system.

## 8.8. FUNCTIONS OF A DSS

There are five function of a DSS facilitating managerial decision making. They are:

- Model building
- What-if analysis
- Goal seeking
- Risk analysis
- Graphical analysis.

### ⇒ Model building

- It allows decision makers to identify the most appropriate model for solving the problem at hand. It takes in to account input variables, interrelationships among the variables, problem assumptions and constraints.
- For example, a marketing manager of Videocon is charged with the responsibility of developing a sales forecasting model for colour TV sets.
- A model builder uses a structured framework to identify variables like demand, cost and profit, analyse the relationships among these variables identify the assumptions, if any (e.g., assume the prices of raw materials will increase by 5% over the forecasting period), and identify the constraints, viz., the production capacity of the plant.
- All this information's are then integrated by a system into a decision making model, which can be updated and modified whenever required.

### ⇒ 'What-if' analysis

It is the process of assessing the impact of changes to model variables, the values of the variables, or the interrelationships among variables.

- This helps managers to be proactive, rather than reactive, in their decision making.
- This analysis is critical for semi-structured and unstructured problems because the data necessary to make such decisions are often either not available or incomplete. Hence, managers normally use their intuition and judgement in predicting the long-term implication of their decisions.
- Managers can prepare themselves to face a dynamic business environment by developing a group of scenarios (best-case scenario, worst-case scenario and realistic scenario). Spreadsheet packages, such as Excel and Lotus 1-2-3, have 'what-if' applications.

### ⇒ Goal seeking

- It is the process of determining the input values required to achieve a certain goal.



- For example, house buyers determine the monthly payment they can afford (say, Rs.700) and calculate the number of such payment required to pay the desired house.

#### ⇒ Risk analysis

- It is a function of DSS that allows managers to assess the risks associated with various alternatives.
- Decision can be classified as low-risk and high-risk environments.

#### ⇒ Graphical analysis

- It helps managers to quickly digest large volumes of data and visualise the impact of various courses of action.
- First, the Lotus system enabled users to easily display and print information in a graphic form. S L Jarvenpaa G W Dickson (1988) studied the relative advantages and disadvantages of tabular and graphic output.

## 8.9. DEVELOPMENT OF DECISION SUPPORT SYSTEMS

- The development of a decision support system is determined by the types of information and the facilities needed for taking the decision.
- Decision support systems are developed using programming language or produced by packages specially in cooperating decision support development tools.
- Conventional high-level languages, such as C++ and BASIC, can be used to develop DSSs. They are extremely flexible. However DSSs using this language involving a lengthy analysis and decision phase.
- Fourth-generation or very high-level languages are more appropriate. They are particularly useful as they are generally data base-oriented.
- This is important for those systems that really rely on data retrieval and analysis for decision support.
- An example of prominent fourth generation language is SQL, which can be used on many relational database systems such as ORACLE.
- The selection of language depends on factors such as:
  - Availability of language and support for it.
  - Experience of developers with various languages.
  - Amount of manipulation vs. presentation of data.
  - Need to document and maintain the program.
  - Frequency of use and number of users.
- The advantages of using programming languages are that:
  - Application development is speedy.
  - Many are end-user oriented.
  - They are more likely to be declarative rather than procedural.
- There are three methods for developing DSSs.
  1. DSS generator
  2. DSS shells



### 3. Customer made software

## 8.10. GROUP DECISION SUPPORT SYSTEMS

- Group decision support systems (GDSS) are computer based information systems that facilitate the free flow and exchange of ideas and information among group members while maintaining their anonymity.
- Other terms have also been coined to describe the application of information technology group setting.
- The terms include Group support system (GSS), Computer supported cooperative work (CSCW), Computerised collaborative work support, Electronic meeting system (EMS).
- Group typically consist of less than 20 people who arrive at decisions through taking process. The decision may be taken by vote for often by negotiation, consensus or preference ranking.
- There are three types of computer based support are available in GDSS. These are

### 🔗 **Decision networks:**

- This type allows participants to communicate though networks with each other or a central database.
- Applications software is using a local area network and microcomputers. The technology filters out many of the typical group dynamics of a participative meeting.

### 🔗 **Decision room**

- Participants are located in one place the decision room.
- The purpose of this to enhance participant interaction and decision making by computerised support within a fixed period of time using a facilitator.

### 🔗 **Tele/computer conferencing:**

- If groups are composed of members or subgroups that are geographically dispersed, tele/computer conferencing provides for interactive connection between two or more decision rooms. This interaction will involve transmission computerised and audiovisual in information.

## 8.11. EXECUTIVE INFORMAION SYSTEMS

- An executive information system (EIS) is a set of computer based tools with features such as colour graphics touch screens, voice activated commands, and natural language interfaces the hep managers to quickly retrieve , analyse, navigate, summarise and disseminate large volumes of data.
- An EIS is frequently connected with on line information services so that top managers can quickly access external data as well. the primary aim of an EIS is therefore the delivery and displays of information rather than the analysis diagnosis of problems and possible solutions.

### 8.11.1. Characteristics of an EIS

An EIS has two special functions:

- **Derived information function:-** It allows managers to find the cause or source of a certain problem through data analysis.

→ **Drill down function:-** EIS precisely locate and retrieve necessary information at any desired level of detail.

Another recent feature found in DSS and EIS that increases the usefulness of drilldown and derived information is a software agent. Many spread sheets have some simple EIS like Capabilities. Microsoft Excel also has many EIS features.

### 8.12. SUCCESS CRITERIA FOR DSS/EIS:

Rockart and Delong (1988) identified eight critical success factors for achieving successful DSS/EIS. These are:

- Commitment from top management.
- Availability of accurate and reliable data.
- Careful problem selection.
- Integrated of DSS and EIS with existing technologies
- Meaningful analysis of cost vs. benefits.
- A clear link to business objectives
- Management of organisational resistance.
- Management of the spread and evolution of the system.

### 8.13 RELATIONSHIP BETWEEN MIS AND DSS

#### ❖ MIS:

- ✓ Management Information system operates on operational efficiency i.e. it concentrates to do the things in right manner.
- ✓ It allows the communication across the managers from different areas in a business organisation.
- ✓ It allows flow of information in both upward and downward direction.
- ✓ MIS is original form of management information.

#### ❖ DSS:

- ✓ Decision support system helps in making effective decisions as it allows to do only right things.
- ✓ It is concerned about leadership and senior management in an organization providing effective judgment support.
- ✓ It flows only in upward direction.
- ✓ DSS is actually advancement of MIS.

### 8.14 DSS MEASURES OF SUCCESS IN ORGANISATIONS:

- It is likely that the effects of DSS on the organisational goals will be difficult to identify.
- Thus, the search for indirect measures of DSS success that can more likely be operationalised.
- A broad indication of the form of these indirect measures is shown in the lower portion of below fig.
- The hierarchy of organisational measures is shown in the upper portion of below fig.

- Where possible success of a DSS would be sought in terms of how well it helped the organisation meet goals on these dimensions. These measures are supra DSS measures.
- A hierarchy of organisational and DSS measures of success are shown in fig.

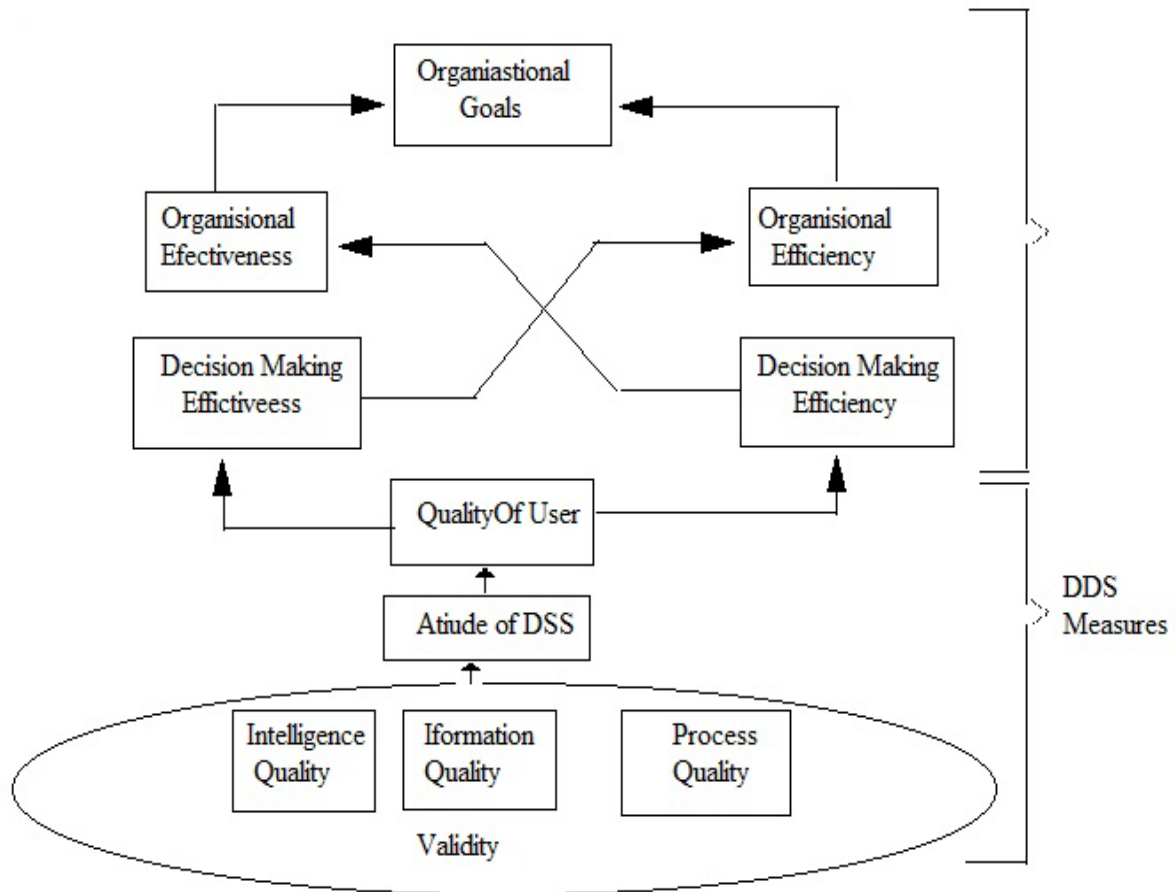


Fig. Organisational Hierarchy and DSS measures of success

## 8.15 APPLICATION OF A DSS

Application of a DSS can be classified into three types. These are:

### 1. Independent problems:

- ⇒ The independent problems are standalone problems whose solutions are independent of other problems.
- ⇒ The goal is to find the best solution to the given problem.

### 2. Interrelated problems:

- ⇒ In interrelated problems solutions are interrelated by each other to find the most effective solutions to the group of interrelated problems.
- ⇒ These types of problems usually require team effort. This requires the coordination of a set of interrelated tasks such as developing an effective advertising campaign, motivation of the sales force, developing pricing strategies, and offering incentives to distributors.

### 3. Organisational problems:

- ⇒ In organisational problem, all departments within an organisation are included. Such problems require team effort.
- ⇒ Total quality management is a good example of an organisational effort, because for it to be effective, it requires a joint effort from all departments/units in the organisation.

## 8.16. TPS, MIS, DSS, AND EIS:

### Difference and similarities among TPS, MIS, DSS and EIS:

	TPS	MIS	DSS	EIS
Targeted audience	Operational management	Operational Management	Middle Management	Top management
Primary purpose	Capture transaction data	Generate summary and exception reports	Facilitate Generate decision making	Clear concise enterprise wide information
Nature of tasks	Highly structured	Highly structured	Semi or unstructured	Semi or unstructured
Type of data	Internal	Internal	Internal and external	Internal and external

## 8.17. FUTURE DEVELOPMENT IN DSS

- The technology in DSS is now reasonably well established, there remains a substantial mismatch between the information and intelligence made available which is necessary for managerial decision making.
- There is also a mismatch between the means by which information is made available and intelligence is produced.
- This is especially true at strategic levels where the need is to be able to handle qualitative, ill-structured and messy information. Most recent DSS are only able to handle quantitative, certain and well defined data.
- Three general areas can be identified where the future thrusts of DSS lie. These are improvements in current DSS the inclusion of expert system methodologies into DSS, and developments in GDSS. In all cases there should be strong moves into the softer more qualitative areas.

## CHAPTER-9

### OFFICE INFORMATION SYSTEMS

#### 9.1. INTRODUCTION

- During the past 30 years, has helped the enhance productivity in the office. The movement towards automation in work is often called office automation (OA).
- Office automation includes the new hardware and software technologies-word processor, spread sheet package, electronic mail and so on-that makes office workers more productive, in addition to the attendant situation created by OA technologies and the people that use these technologies.
- These combinations of information technologies that have a dramatic impact on day-to-day office operations are called office information systems (OIS).

#### 9.2. OFFICE AUTOMATION

- The origin of office automation can be traced back to early 1960s, when IBM coined the term word processing to describe the activity of its electronic type writer division.
- The term expressed to concept that office activity is centered on the processing of the words.
- The intent was to draw the same attention to office products that have been lavished on computers and data processing.
- Since the debut of word processing, other technologies have been applied to office work.
- It includes all formal and informal electronics systems primarily concerned with the communication of information to and from person both inside and outside the organisations.

#### 9.3. OFFICES AND OFFICE SYSTEMS

- The fundamental network of office work has changed drastically over the past 30 to 40 years.
- At one time, virtually the only role of equipment in the office was to help workers become more efficient. Until the mid-1960s, only the type writer, phone, copying machine, were standard office equipment.
- Now, as computer technologies have a strong presence in offices, office workers have powerful tools that make them more effective.

##### 9.3.1. Nature of the Office

- An office is a place where staff and line professionals, secretaries, and clerk perform management and administrative tasks. The work performed by office workers is often called white collar work.
- There are five types Office workers found in the office :
  - 1. Managers** – Managers generally most of their time in planning, coordinating and controlling the activities of other people. Some examples are examinations controller, chief executive officer, operations manager, head of marketing research, and the principal of the college.

**2. Staff professionals** – Staff professionals support the activities of manager. These professionals have no direct line responsibility, i.e., their role is mostly one planning analysing, and informing management of their finding.

**3. Line professionals** – Line professionals includes sales persons and purchasing agents. They typically interact daily with such outside groups as the organisation's customers and suppliers.

**4. Secretaries** – Secretaries are normally assigned to one or more knowledge workers in an office. They perform such support tasks as typing, filling, answering phones, and keeping appointment calendars.

**5. Clerical personnel**- Clerical personnel are usually not assigned to anyone in particular. They support the entire department/section/division. Typical tasks of clerks are filing, typing, and assisting in report preparation.

### 9.3.2. Evolution of Office Systems

- Until the mid 1960s, information technologies, in the office were typewriters, phones copying machines and electric adding machines. In 1964, a seemingly modest typing called **word processing** appeared. Since then, information processing in the office has never been the same. The introduction of microcomputers and small business computers in the late 1960s and early 1970s also contributed to the alteration of the office's technology. Smaller computers made it possible to decentralize computing down to regional offices and individual offices. It was not unusual for large offices to own their computer. This trend towards decentralization was called distributed data processing (DDP).
- The primary purpose of office information systems is to facilitate communication among members of an organization and between the organization and its external environment. An office information system allows individuals and group members to create, store and exchange messages through a variety of communications media, including data, documents , images , voice (audio), and video.
- Various kinds of office automation tools and equipment needed to support these tools are given in table:

**Table: Office Automation Tools and Equipment Needed for OIS**

Tool	Type of data	computer	description	technology
Word processing	written	Yes	Programs that make it easy to create and alter documents.	Computer, printer
Desktop publishing	written	Yes	Programs with extensive word processing and graphic capabilities.	High-resolution computer, printer
imaging	Written, graphics	Yes	Imaging converts paper, microfilm, microfiche, and electronic data into digital images that can be printed, fixed, or viewed on computer screen.	Scanner, optical disks, workstation.

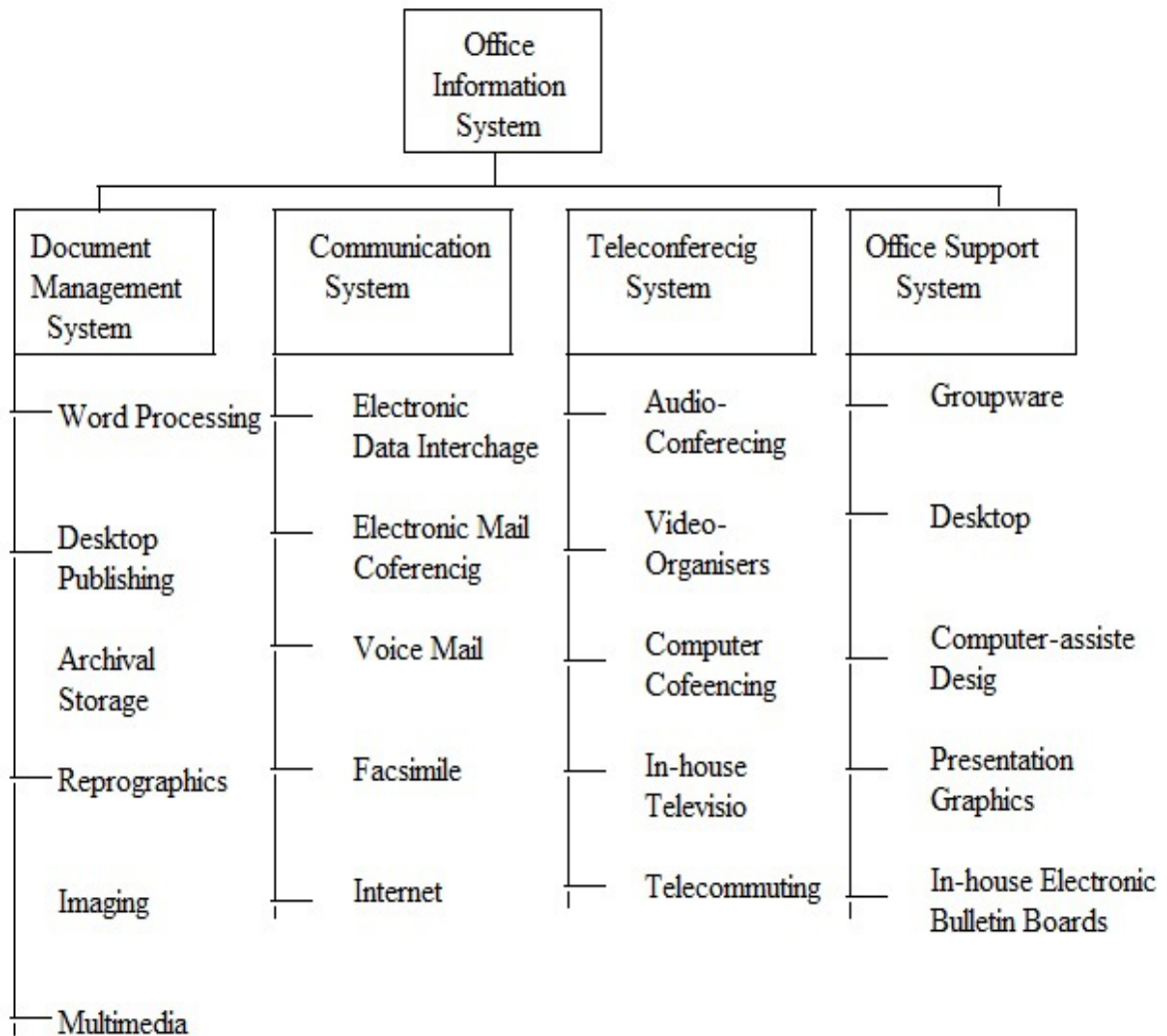
E-mail	Written	Yes	Programs that allow individuals, who are linked through a network, to electronically communicate with each other, anytime, anywhere in the world.	Computer, network
Fax	written	No	Uses telephone lines to transmit documents.	Fax machine, telephone
Groupware	Oral, written, visual	Yes	A broad term given to communication tools such as E-mail, voice, fax, and videoconferencing that foster group decision making.	A multitude of tools are groupware. The nature of the tools depends on the kind of application.
Videoconferencing	Oral	No	A type of electronic meeting Telephone system that uses telephone, TV, computer and communication links to allow geographically separated decision makers to hear and see each other.	Telephone, television, network.
Multimedia	Written, audio, visual	Yes	A computer based tool that uses a graphical and interactive interface and combines two or more media type, such as text, graphics, animation, audio, and video. Today, many, computers have multimedia capabilities which include a sound card and a video card.	Multimedia computer and printer.
Voice Mail	Oral	Yes	The sender's voice message is processed by a modem and stored in a server at the receiver's end. When the ready to receive the message, the digitized from the sever and reconverted into analog signals.	Telephone server, network



## 9.4. TYPES OF OFFICE AUTOMATION SYSTEMS

There are four types of office automation Systems:

- Document management systems
- Communication systems
- Teleconferencing systems
- Office support systems



**Fig: Major components of an office information system**

### 9.4.1. Document Management Systems

- Document management systems are computer based tools that provides access to repository of data, regardless of their form or location.
- The retrieved document can be displayed in different format, edited, distributed, and integrating using other communication systems.
- These communication systems include word processing, desktop publishing, archival storage, reprographics, imaging and multimedia.



- Such systems enable knowledge workers to better control, coordinate and manage the myriad electronic documents used in decision making.
- The application of management systems are
  - **WORD PROCESSING**
- The most widely used and recognized office-system technology is word processing.
- It involves hardware and software tools that allow the computer system to become more than a powerful typewriting device.
- The word processor enable documents to be created and edited electronically, with the assistance of the computer system's processor memory, and display device.
- When the document is finished, it can be stored in secondary storage (typically on disk) or output the systems printer in a variety of formats.
- Today word processing packages that run on general purpose computers is in the micro computing area , where such packages as word perfect ,Microsoft word, WordStar, ms-office are among the current leaders .
- Many of these packages are recently released versions for the windows operating environment.
- Newer versions of these packages incorporate numerous graphics and desktop publishing features that were not included in earlier version.
- With the popularity of computer networking, shared word processing systems are design to share the resources of a communication network.
- Example-LAN, WAN.

---

**Word Processing Characteristics**

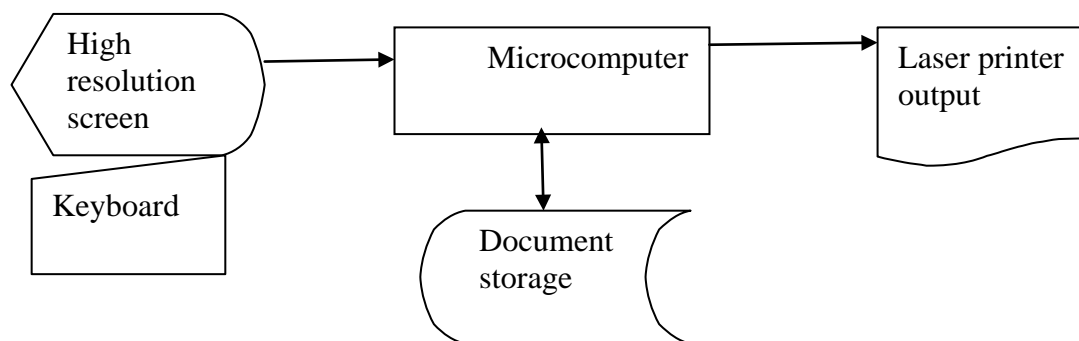

---

Standard Entering and editing operations	Standard pre-formatting operations	Advanced operations
Moving the cursor to various places on screen	Adjusting line spacing	Mailing list preparation
Scrolling the document up and down	Indenting blocks of text	From-later
Returning lines automatically	Reformatting blocks of text	Math feature
Inserting and deleting characters and blocks of text	Centering text	Sorting
moving and copying blocks of text	Proportionally spaced characters	redlining and edit tracing
Searching for text strings	Automatic page numbering, headings and footings	Cross-referencing
Replacing text strings	Multiple columns per page	Preparing index and table of contents

---

- **DESKTOP PUBLISHING**

- Desktop publishing is the use of a computer to prepare printed output.
- It consists of a microcomputer configuration. The configuration includes a high resolution cathode ray tube screen and a laser printer, and is driven by DTP software.
- The high resolution screen enables the operator to display the image in a WYSIWYG from. WYSIWYG means “what you see is what you get”.
- The screen display looks exactly like the hard copy that will be produced by the laser printer.
- The DTP software permits the selection of type fronts and size, hyphenation and write margin justification, the addition of horizontal and vertical lines, and lay out of pages (including graphics).



(Fig: A DTP system)

- DTP application fall into there are:
  - Administrative applications include documents intended space for such internal uses correspondence, reports, and news letters.
  - Technical application includes such training materials as solids, overhead transparencies, and manuals.
  - Corporate graphics include advertisements, brochures, and other documents intended for use outside the frame.
- To the MIS organization, beyond the technology of DTP lie many management-oriented challenge and several opportunities.
- Educating users and establishing standards for use are among these challenges.
- The problems of implementing DTP systems are that some users carry DTP to its extreme and also the lack of general knowledge about DTP.

#### Archival Storage

- One of the key functions in an office is storage.
- To save the expense associated with storage space, handling, and paper costs, archival data was traditionally placed onto various media and stored off-line.
- Such media are also particularly useful to firms requiring keeping large files available that do not have to be updated, or to firms that need to process large amounts of data but find on-line access too expensive.
- Four common technologies used to store archival materials are:-
- **Magnetic tape:** - it is one of oldest and most common ways of storing data for archival purpose. Tape is inexpensive, compact, and can store rather text files.

- **Computer output microfilms (COM):-** COM refers to all technologies that either place data onto microfilm media-such as a reel of microfilm or microfiche card- or that allow those to be read by humans. Microfilming media are often superior to magnetic tape because they are better suited to graphic data, easier to handle and use in many situations, and are more rugged.
- **Optical disks: -** Optical disks for microcomputers store 650 MB of data on a single 5.25" platter. Those from midrange and mainframe and systems are usually larger in diameter and have storage capacities in the multigiga byte range. It is felt that this medium will encroach seriously on the archival storage niche now occupied by COM.
- **Diskettes:-** Diskettes are suitable only in those situations in which modest amounts of archival storage are necessary.

### Reprographics

- Reprographics is the process of reproducing multiple copies document.
- Office personnel are usually responsible for making more than one copy of a report, letter, and other documents are widely distributed, either internally or externally, reprographics often includes collating, folding, binding, and related tasks.
- Most of the time, however, a photocopier is used for multiple copies.
- The most sophisticated type of equipment currently available is the *intelligent copier system*. That documents created on microcomputer workstations or display terminal may be electronically transmitted to the intelligent copier.

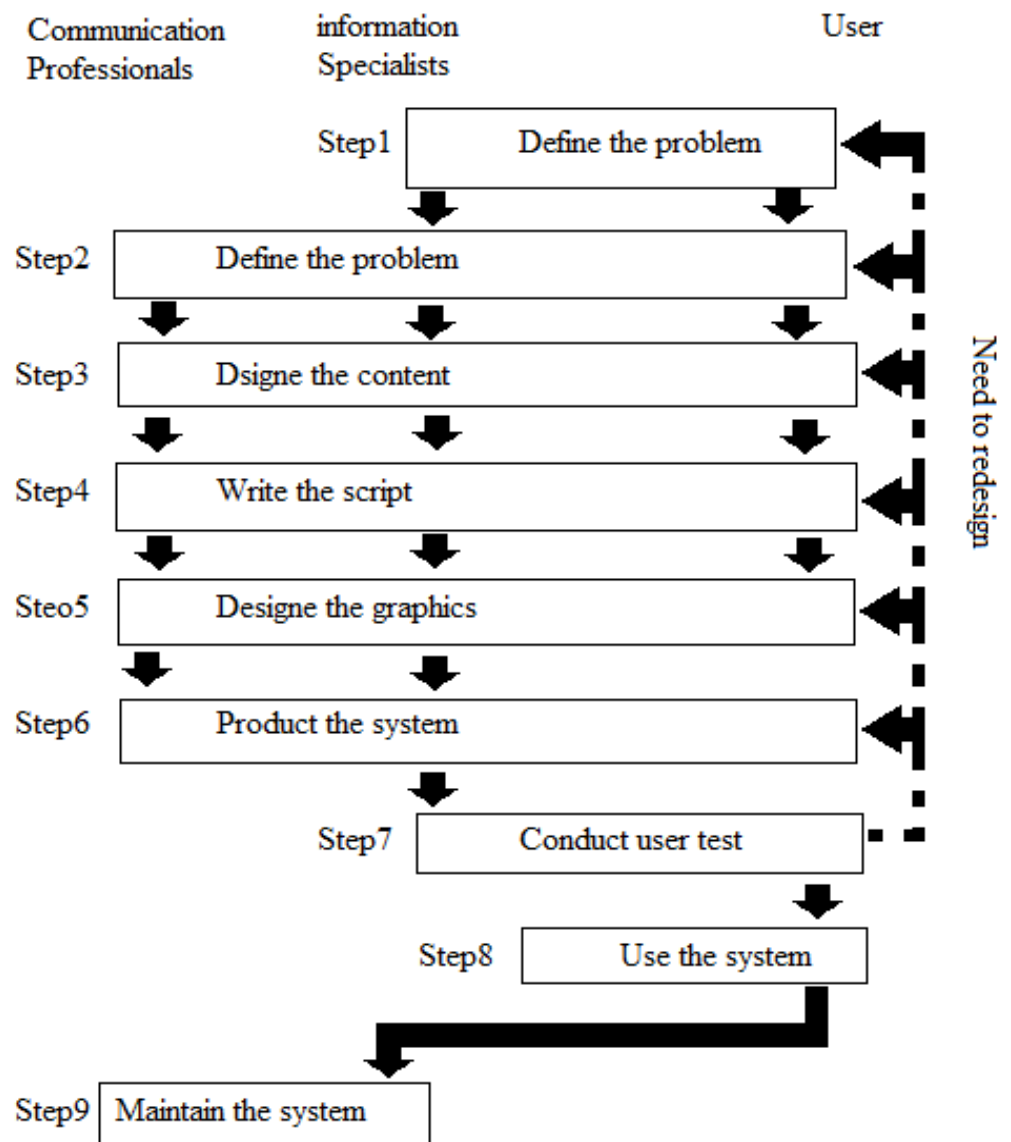
### Imaging

- Imaging is a type of document management system that converts paper, microfilm, microfiche, and electronic data into digital image that can be printed, faxed, or viewed on a computer screen.
- LAN based image-processing system, nowadays common in use, include several servers, each dedicated to a specific function such as database management, scanning or printing.
- The main advantage of imaging is the decrease in storage costs.
- Imaging allows more than one person to view or analyse a document at the same time.
- Imaging changes the work flow from sequential to parallel, increasing productivity.
- Imaging is used in problem solving when it is required to review historical documents for understanding a problem. An operator accesses the document management system from a workstation and produces a hard copy output for the manager.

### Multimedia

- Multimedia encompasses a group of computer-based technologies that integrate different types of media, such as text, graphs, animation, audio and video, to generate information. Multimedia is made possible by integrating audio and video capabilities into personal computers.
- Besides the usual CPU and peripherals, for a computer to have multimedia capabilities it should also have a CD-ROM drive, stereo speakers, a microphone for voice input, a sound card, a video card, and a video compression card.
- Any problem that requires the integration of text, sound, and video can be approached by using multimedia, in particular, is very useful in corporate training and business presentations.

- Multimedia is interactive (allows two-way communication) and provides consistency in the content and the material can be accessed by trainees at their convenience and can be viewed at any desired place.
- **Multimedia system development**  
The newness of the technology makes multimedia a good candidate for prototyping. Multimedia experts have recognised the unique challenges of system.



**Fig: The multimedia system development process**

- 1. Define the problem.** The system analyst identifies the user's needs and determines that the solution requires multimedia.
- 2. Design the concept.** The systems analyst and user, possibly working with such communication professionals as producers, directors and video engineers, engage in concept design by determining the overall message and conducting a walkthrough of all major sequences.

**3. Design the content.** The developers engage in content design by preparing detailed application specifications. These are where the media are selected. It is important to avoid the Christmas tree look of incorporating too much multimedia and too little system functionality.

**4. Write the script.** The dialogue and all of the detailed elements of the sequences are determined.

**5. Design the graphics.** Graphics are selected that support the dialogue. Any necessary sets or props to be used in video are designed.

**6. Produce the system.** The system developers produce the various parts and integrate them into a system. In addition to development of the application software, the tasks involve such specialized activities as video editing, and authoring. Authoring is the integration of the separate elements through the use of special prewritten software.

**7. Conduct user Tests.** The systems analyst educates the user in system use and gives the user an opportunity to become familiar with all of the features. If the system is satisfactory, the user puts it into use. Otherwise the prototyping process is repeated by reverting back to an earlier step. This iterative process is repeated until the user is satisfied with the system.

**8. Use the system.** The user benefits from system use.

**9. Maintain the system.** In other computer-based system, the multimedia system must be maintained. The main difference is that the user cannot be expected to perform the maintenance. This is the task of the specialists and professionals. Multimedia is not an end-user computing application.

### 9.4.2. Communication Systems

Various communication systems being used in office automation systems are:

#### ➤ **Electronic Data Interchange:**

It is the transfer of electronic data from one organisation's to another. The data being structured in a commonly agreed format so that it is directly usable by the receiving organisation's computer system.

#### ➤ **Benefits of EDI**

- The speed with which an inter-organisational transaction is processed.
- The paperwork involved in transaction processing is eliminated.
- The costs of transaction processing are reduced as much of the need for human interpretation and processing is removed.
- Reduced human involvement reduces error.

#### ➤ **Electronic mail**

Electronic mail is known as E-mail. It is a system that allows a person or a group to electronically communicate with others through a network, in written form, at any time, from anywhere in the world. A user types a message at his/her terminal keyboard, the message is stored in the electronic of the recipient, using his/her terminal and providing the proper password. The electronic mailbox is usually a file on a server. Electronic mail software controls the process. Users can also edit, sort, save and classify messages and forward them to other individuals on the network. If two users are logged onto the network at the same time, they can converse through E-mail. Some E-mail systems have multimedia capabilities allowing E-mail users to send not only text, but also voice and still pictures. E-mail is a popular form of business communication with the majority of organisations

possessing an E-mail address. There are a number of windows- based communications software programs for dealing with the sending and receiving of E-mail.

E-mail has many benefits.

- ❖ It is very cheap.
- ❖ It allows organisations to be responsive to customer needs.
- ❖ It provides instantaneous access to and dissemination of information, thereby eliminating the time lag involved in using the postal service.
- ❖ E-mail messages do not get lost or reach the wrong party.
- E-mail package provide following facilities:

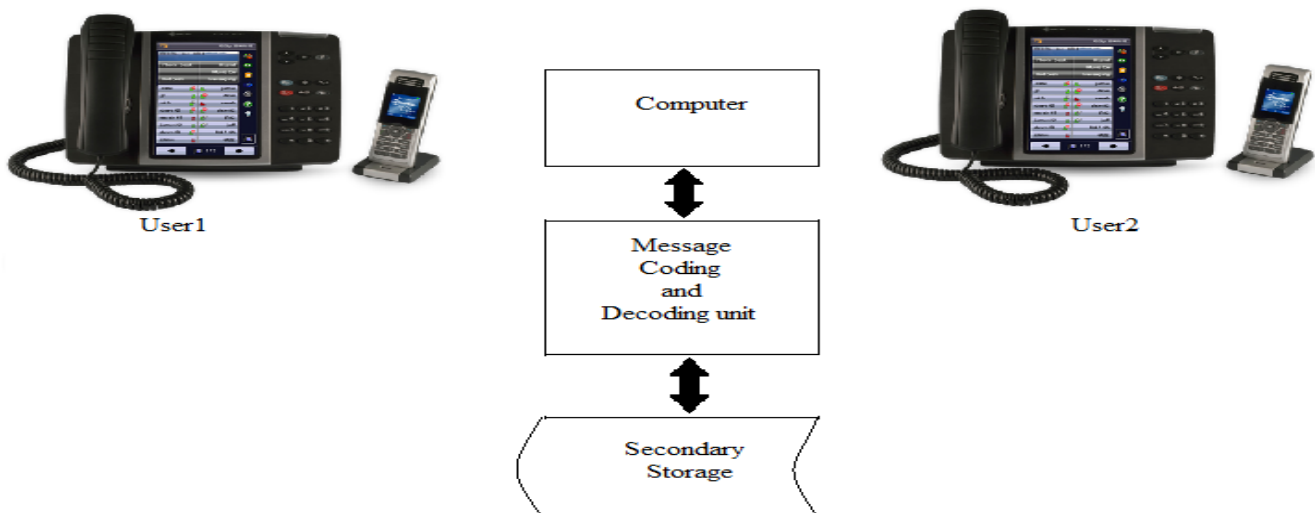
1. **Notification of receipt/reading.** On receipt/reading of the E-mail, the receiver package automatically replies with an acknowledgement. It is often useful to know if a recipient has received and (particularly) read a message.
2. **Mailing and Distribution Lists.** The E-mail package enables a user to build up several lists of E-mail address which can be called up and inserted with one key stroke for example, all departmental heads, or all client contact names.
3. **Forward or reply.** A message may be forwarded or replied. This can be accompanied by the reader's comments (editing) and be with or without the original text.
4. **File attachments.** Files, for example word processed document files, or spreadsheets, can be attached to messages and loaded into receiver software.
5. **Folders.** Received messages can be automatically stored in different electronic folders.
6. **Filters.** Filter facilities allow mail to be selectively read and stored depending on whether the messages meet some rule specified by the user.

➤ **Electronic mail services.**

When an organisation decides to implement electronic mail, it has two basic choices. It can acquire its own hardware and software and install an in-house system, or it can subscribe to an electronic mail service that provides the necessary computing and communication facilities for a fee. In the latter case, a subscriber need only furnish the terminals to tie into the network.

➤ **Voice mail**

Voice mail facilitates oral communication. In this system, the sender dictates a message by speaking them over the telephone rather than typing them. A special device, called a codec, converts the analog signal of the sender's voice into a digital message. The message is transmitted over the network and stored in a server at the receiver's end. A blinking light on the receiver's phone indicates that he/she has a voice message. When the receiver chooses, the digitised message is retrieved from the server, reconverted into analog form, using a codec at the receiver's end, and the receives it over the phone. Some voice mail systems can send the same message to more than one person, reroute a message to another phone, save messages for future reference, and retrieve messages from any telephone, anywhere in the world.



**Fig: A Voicemail Configuration**

➤ **Facsimile**

Facsimile is known as fax. Systems are commonplace in most organizations today. Fax technology uses telephones, modems, and scanners to transmit text and graphics to an individual or organisation anywhere in the world. The scanner in the fax machine scans the document at one end and at the other end, a built-in modem receives the message, and a printer prints it. Fax machines can send the same document to multiple users. They can also be integrated with applications such as word processors. So that faxes can be edited without being re-entered into the computer. Fax machines can be programmed to send faxes at a time.

➤ **Internet**

- It is a global network of millions of smaller computers networks linked by a Terrestrial and extra-terrestrial communications channels.
- The most significant business promise of the internet lies in the potential for global electronic commerce known as e-commerce, in the shape of transactions conducted through the millions of computers networks that make up the internet.
- The internet is a relatively inexpensive business resource that permits small organizations to compete with large organization because of the absence of any measure cost or competition constrains of using the web.
- A web site is a set of linked information pages which forms a unique home location for a user won the internet individual and organizations can create their own wave sides of information to reflect to their own business needs.

➤ **Extranets.** Extranet is the new buzzword in the arena of internet. It can be defined as a business-to-business intranet that allows limited, controlled, secure access between locations. It allows organizations to communicate faster and more effectively with customers and business partners.

➤ **Universal resource locator (URL).** Each page on the web is on a website which is itself located on a computer attached to the internet. Each computer attached to the internet has an address. The URL identifies the location of a resource on the web (type of resource, site and



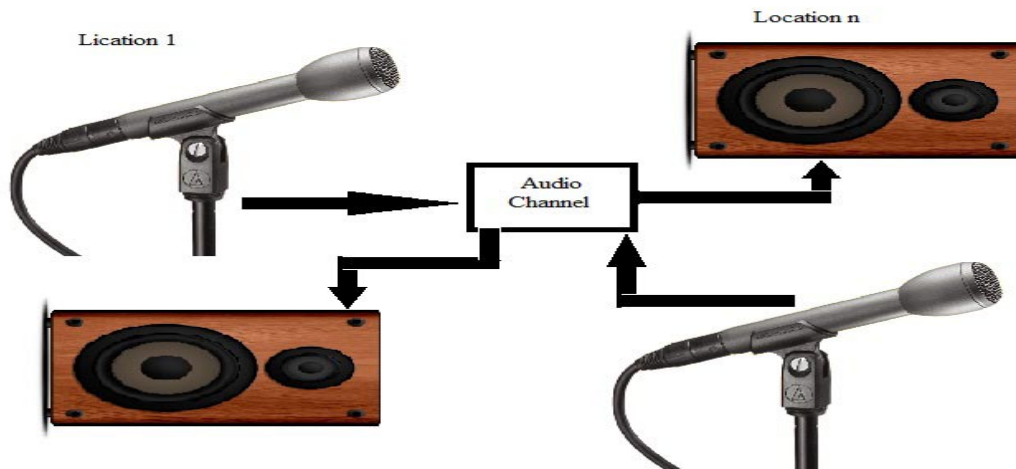
position or path to the resource at the site). It is useful to think of the URL as the web page addresses.

- **Web search engines.** It is a program which, when running, makes connection to many thousands of websites a day, retrieving and indexing web pages from these sites. A web search engine will have visited and indexed millions of web pages. This index will be stored at the website associated with the search engine. A user accesses the website at which the search engine is located and enters, via a form on the screen, a word or words, known as the search string of search interest. The web search engine then display at the user's terminal the URLs of all sites at which the search string is located.
- **Plug-ins.** Plug-ins is small programs that are 'loaded into' a larger program in order to add some function. The plug-in may be produced by an organization different from the publisher of the publisher of the larger program. Web brokers may have plug-ins associated with them that allow carrying out extra functions.

### 9.4.3. Teleconferencing Systems

- It consists of tools and techniques of both computer and non-computer-based.
- In this techniques that allow a group of people, separated by time and distance, to exchange ideas using audio, video and other teleconferencing media.
- The main feature of this system is that they reduce operating costs and increase productivity because decision makers do not have travel to attend face to face meeting.
- **Audio conferencing**
  - Audio conferencing is the use of voice communication equipment to establish an audio link between geographically dispersed persons for conducting a conference.
  - The conference call allows more than two people to participate in telephone conversation.
  - It was the first form of audio conferencing. Some firms install private, high-quality audio communications circuits between the conference sites that can be activated with the flip of a switch. It does not require a computer.
  - Audio conference is best suited to firms that are spread over a wide area.





**Fig: Audio conferencing**

- Audio conferencing can be made more efficient by following a few simple rules as given below:
  - The person who organizes the conference should serve as a moderator, making certain that all participants have an opportunity to speak and that the objectives of the conference are archived.
  - The numbers of participants should be kept to a manageable size, say no more than 10.
  - A copy of the conference agenda should be made available to the participants in advance.
  - When participants speak, they should identify themselves.
  - A taped record of the conference should be kept.
  - A hard copy record should be prepared from the taped record, and distributed to all participants.
- **Video conferencing**
  - Videoconferencing is another type of teleconferencing systems that uses telephones, TV monitors, computers, and networks to link geographically separated decision makers to hear and see each other.
  - A computer digitizes sound and video images, then converts them to analog signals and transmits them over the telephone lines to the receiver's computers, which reconverts the analog signals to digital signals.
  - These are then translated into audio and video messages and presented on the TV monitor and sound system.
  - There are three basic types of video conferencing (McLeod, 1993), based on the signal capabilities:
    - **One-way video and one-way audio:** Video and audio signals are sent from a single transmitting site to one or more receiving sites.

- **One-way video and two-way audio:** The two way audio capability allows people at the receiving sites to talk to people at the transmitting site while every one views the same video images.
- **Two-way video with two-way audio:** The video and audio communications between all sites are two-way.
- Video conferencing avoids travel costs, firms are not motivated to use it solely for that reason.
- Instead, firms regard video conferencing as a way to get more managers involved the decision-making-managers who otherwise would not participate because of their geographical location.
- **Computer Conferencing**
  - Computer conferencing is the use of a networked computer to allow members of a problem-solving team to exchange information concerning the problem that is being solved.
  - In this system, a group can consist of a large number of participants.
  - It differs forms audio and video conferencing in that it can be used within a single geographic site. A person can use computer conferencing to communicate with someone in the next office.
  - Teleconferencing includes all three forms of conferencing-audio, video and computer.
- **In-house Television**
  - It is a relatively new technology. In this system, an organisation invests in a studio, a period of time on a satellite and a satellite transmitter for broadcasting.
  - Company sites or even customers are given satellite dishes so that they can view the broadcast.
  - Scramblers inhibit competitors from gaining access to the transmission.
  - This technology has already shown potential in the areas competitive advantages, cost cutting and employee motivation.
- **Telecommuting**
  - With telecommuting, people use communications technology to work at home or in a remote city and to avoid the usual physical commute to work.
  - Using a remote communications terminal or a microcomputer work station, a person can do his/her work at home instead of at the office.

#### 9.4.4. Office Support Systems

- In this system some important systems for managing documents, exchange messages and holding meeting are discussed. In addition to these systems, various applications help to coordinate and manage the activities of work groups.
- **Groupware**
  - Groupware consists of software packages design to support the collaborative efforts of a group of co-workers.
  - Such packages often provide integrated support for many of the typical activities of work groups of work groups.

- This includes: word processing services, E-mail, voice mail, fax, computer conferencing, video conferencing, project management, group decision support system, electronic bulletin board systems and electronic calendars and schedulers.
- It is generally agreed that groupware is an electronic knowledge. The essential components of groupware are linking group members who are geographically separated using networks. It eliminates the barrier of time and space and allows different group members to work on the same documents at the same time.
- **Desktop organisers**
  - Desktop organisers are software package that provide users with the electronic equivalents of the organising and coordinating tools found on a typical office desk. Among many features, it includes electronic calendar, card file, notepad, clock and calculator.
- **Computer Aided Design**
  - Computer aided design (CAD) refers to computer systems that enable designers to work with a display-screen and specifications database to design various products. It is widely used in engineering environments.
- **Electronic Bulletin Boards**
  - Electronic bulletin boards allow members to post their ideas and elicit responses from other group members. Primary benefits are increased responsiveness to market forces and significant improvement in the quality of business processes such as product development, account management, and customer service.

## 9.5. INTEGRATED OFFICE

- An organization can acquire separately the necessary hardware, software, or services required to implement any of the applications.
- Nowadays, integrated office packages can be purchased or leased from software vendors.
- An integrated office package features word processing, E-mail, and several desktop organising tools.
- In this might entail integrating any of the following sets of heterogeneous elements.
  - The hardware and software products of several vendors.
  - Various communications protocols.
  - Text, graphics, voice and video data.
  - Various types of computers networks and network elements, e.g., LAN, WAN, PBX, intelligent copier systems, and gateways to large mainframes and/or remote commercial databases.
- Office information systems are successfully implemented in many ways.
- Most problems with implementation stem from a lack of clear objectives for office systems. Success is more likely when the organization implements new office technologies after a careful strategy is planned.
- Individual office automation applications can be implemented through integrated office software packages or through a more comprehensive integrated office strategy.

# CHAPTER-10

## INFORMATION SYSTEMS IN BUSINESS

### 10.1. INTRODUCTION

The role of information systems in organisational productivity has been extremely challenging. This is partially because the benefits of information systems are often intangible, manifesting themselves in areas such as improved customer service and greater organisational responsiveness. Hence, organisations are developing new measures, such as reduce cycle times and delighting the customers come to better major the impact of information system in organisational productivity.

The various functional areas in business, including manufacturing, marketing finance and accounting, quality control and human resources have all been influence by information systems. These functional areas, using information system, to capture new market achieve at competitive edge in existing are planning to develop cross functional systems

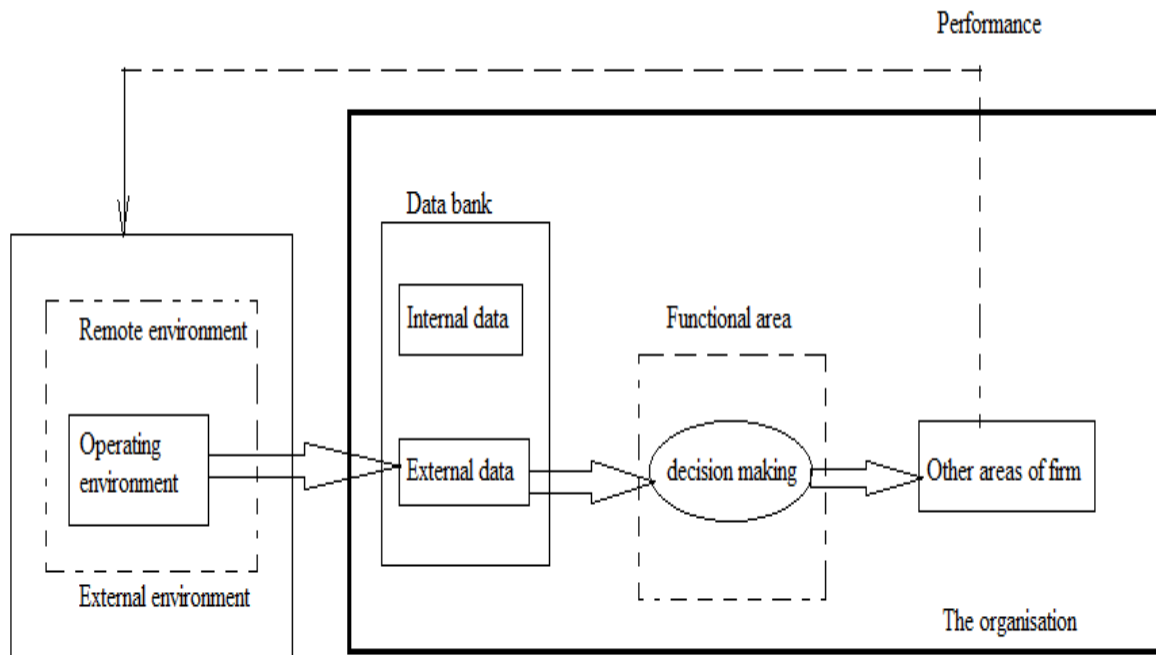
### 10.2. FUNCTIONAL AREAS OF BUSINESS

The following five functional areas in an organisation are:

- Manufacturing.
- Quality control.
- Marketing.
- Accounting &finance.
- Human resources.

In each of the functional area, a data flow model portrays the local decision making environment. Figure shows the data flow diagram, which consists of the following components:

- **External environment :-**The external environment contains two components the operating environments, which consists of consumer, suppliers, competitors, distributors, and the labour supply; and the remote environment, which consists of economics, social, political, technological, an industry concerns. These environmental sources generate key external information that flows into the firm, at times informally.
- **Data bank:-**It is used generally to describe the general storage of data. A data bank can include data existing in files and in computer databases. An organisation's data bank consists of internal data, such as those generated from the firm's transaction processing system or from monitoring forecasts and external data which are collected from monitoring the external environment. Both types of data have information potential.

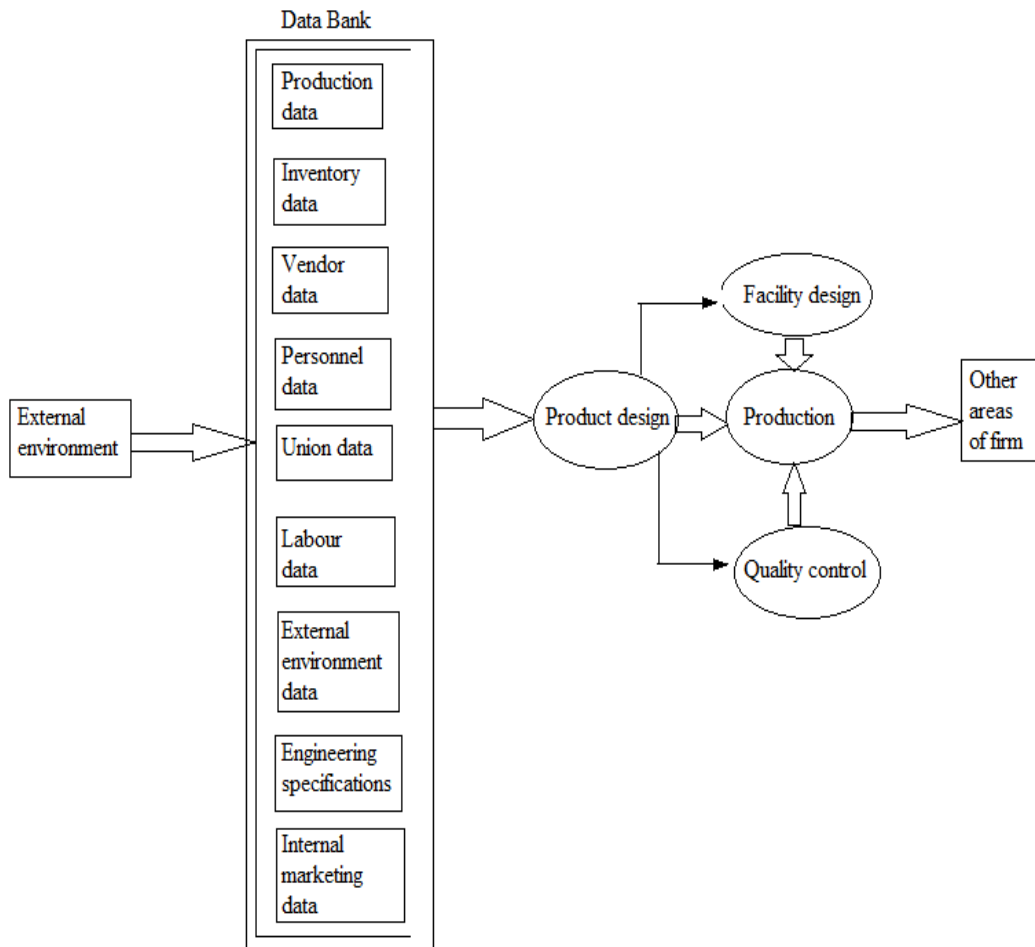


Data Flow Diagram in Basic Function Areas

- **Decision making:-** Decision making is the key of each functional data flow model .this process consists of selecting those data needed to make a decision and then making the decision.
- **Other areas of the firm:-**Information produced by decision making in one functional area is often used in another. For example, sales forecast prepared by the marketing department is used as data by the finance department to produce the overall financial plan for the firm.
- **Feedback mechanism:-** The dotted feedback arrow indicates that decision made by the firm ultimately affect its performance in the market place. The firm's performance, in term, generates other data that are used by elements in the environment. The firm's performance is often important on the competitor's, consumers, and suppliers. Only a radical change coming from within a big organization such as a state (or provincial) government, or a corporate giant, like Tata industries; would cause noticeable change in the remote environment.

### 10.3. MANUFACTURING INFORMATION SYSTEMS

- Manufacturing information system is a system the support the manufacturing functions of purchasing, receiving, quality control, inventory management, material requirements planning, capacity planning, production scheduling, and plant design. It performance applies to both Manufacturing and service environments. Hence, the term manufacturing should be considered in terms of delivering both goods and services.



Data Flow Representation of manufacturing Information System

Generally, the primary decisions made in the manufacturing include product design, production, facility design, and quality control.

- **Product design** is the starting point of the manufacturing process. It is the step in which the design and technical specifications for the product are finalized. Increasingly, product design and engineering are becoming more computerized through approaches such as computer aided design (CAD), computer aided engineering (CAE), and robotics. After a product is designed, the facilities to manufacture must be planned. This design may be as simple as changing a few manufacturing stations on the production floor or as complex as designing an entirely new plant. The computer can also model plant layout. Monte Carlo simulation on computers has been used since 1950s to address certain facility layout problems –sometimes with substantial success.
- **Production** is the process of making new products from raw materials. Generally, the production methods: job shop and process. Most production process as an integrated system. Some firms are trying to integrate CAD, CAM and other manufacturing activities, a concept known as computer integrated manufacturing (CIM). All manufacturing processes concerned with information processing, storage, collection, and distribution are related in a way that optimizes performance of the entire enterprise. Integration allows organizations to efficiently manage (and control) manufacturing and engineering information by eliminating barriers

across departments and functions-possibly even across organizations.

- **Agile manufacturing** refers to manufacturing environments that are dynamic and flexible enough to instantaneously produce customized goods and services in varying quantities and to effortlessly switch the manufacturing process from one product to another. Agile manufacturing has four main characteristics:
  - 1:-The ability to thrive on constant change.
  - 2:-recognition by the organization that people are its main asset
  - 3:-Incorporation of the virtual company idea through the use of telecommunications.
  - 4:-A focus on creating products and services with real added value.

### 10.3.1 Sources of Manufacturing Information

- **Product data.** By using terminals around the production floor, data on production processes can be quickly gathered and processed. These data are used for billing and in almost every aspect of production control.
- **Inventory data.** it includes inventories of raw materials goods –in-process, and finished goods. Accurate raw material data are especially imp in a manufacturing situation because running out of certain items at critical times can shut down production lines, leaving workers idle.
- **Vendor data.** It shows sources and prices for raw materials. Often, it are maintained by the purchasing department, although, sometimes the manufacturing area will personally buy certain items. In any case, manufacturing personnel must be constantly aware of the origination of their raw materials, what new types of products are offered by vendors, and current prices.
- **Personnel data.** It shows various statistics on current manufacturing personnel.
- **Union data.** Many types of labour today are unionized production shops usually have strict regulations regarding such items as pay scales, hiring and firing, promotion, and working conditions.
- **Engineering specifications.** It is the data indicate whether something can be built and how. It contain such facts a size of screws; whether a certain drill bit is suitable for wood.
- **Internal marketing data.** It ends where manufacturing begins, so marketing output is manufacturing input. Marketing specifies the number of units of goods that must be product in each time period in order to meet consumer demand.

### 10.3.2. Advantages of Manufacturing Information System

Manufacturing goods & services is the main function of a business. The information generated from the shop- floor drives the rest of the organization. Hence, the firms that have well – integrated manufacturing information systems are bound to reap significant benefits.

In late 1990, an India-based multinational firm started replacing its PC- based manufacturing system with a new manufacturing information system called integrated information system architecture. The main objective was reducing manufacturing cost and cutting down cycle times. The new system, which used data base, networks, GUIs, and of the shelf software, allows 1800 employees distributed throughout the firm to easily access enterprise-wide manufacturing data by integrating a num of code business system. Embedded with decision support capabilities, the



system allows managers to be decision making instead of data collectors.

## 10.4. MARKETING INFORMATION SYSTEM

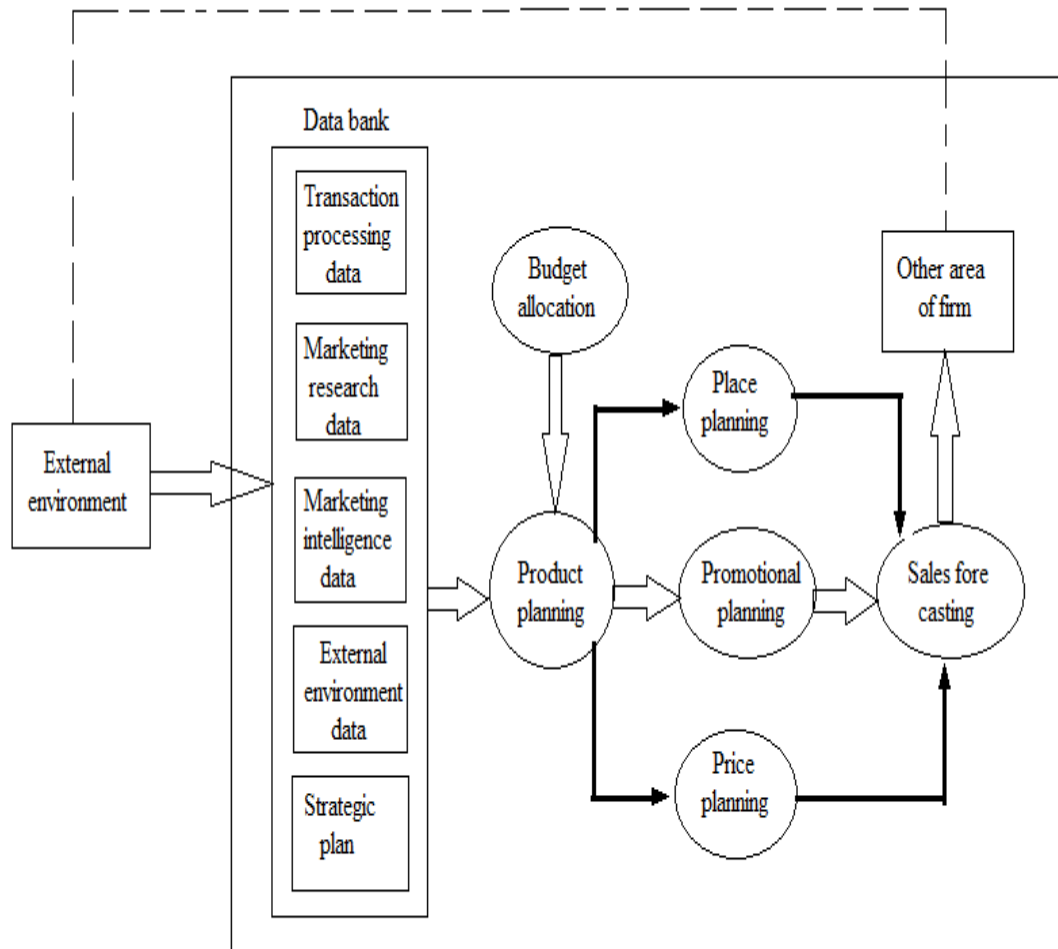
Marketing strategies consist of a mixture of ingredients that has been named the marketing mix product, promotion, place & price. Collectively they are known as the four Ps. Product is what the customer buys to satisfy a perceived want or need. Promotion is concerned what all the means of the encouraging the sale of the product, including advertising & personal selling. Place deals with the means of physically distributing the product to the customer through a channel of distribution. Price consists of all the elements relating to what the customer pays for the product.

### 10.4.1. Input of Marketing Information Systems

Information used for marketing, decisions arrived at from different data sources, the most important of which are:-

- **Transaction processing data:** This data show the sales that result from specific mixes of the four Ps. Thus they provide feedback on the effectiveness of past marketing strategies.
- **Marketing research data.** Marketing is the it is responsible for gathering consumer- related data that can be used to support making decisions; example, personal interviews, phone interviews, 7 mails survives. Often tests determined if the research findings are statistically significant or if they should be attributed, instead, to chance.
- **Marketing intelligence data:** marketing intelligence refers to information about the strategies of competitors. The term “intelligence” is a carryover from the military, which uses the term to describe data gathered about enemy activities. Most making intelligence information is collected in an unstructured or semi structure manner: through word of mouth interaction or through observing statistics available in the media & commercial data –base services.
- **External environment data: in market,** success is largely attributable to what will happen in the function external environment. For example: - when a new car is introduced, the firm never knows exactly how consumers will react to it. 198 out of 235 people are tested the prototype loved it & said they would buy it.
- **Strategic plan:-**the strategic plan is really the starting point of all marketing decisions. It contains the type of product that the firm plans to supply to the consumer marketplace. These broad guidelines define the direction of the marketing effort. The tactical marketing plan addresses what, how, when & where questions that is appropriate to the implementation of the strategic plan.





Data flow representation of the marketing information system

### 10.4.2. Outputs of marketing information systems

- **Product planning:**-It is often complicated, unstructured decision. A number of factors contribute to a products success or failure. Complicating these product planning decisions are the facts that the choice of consumers constantly change & that competitors always develop new products. Most products follow a product a life cycle.
- **Place planning:**-It refers to the channels of distribution that a firm uses to get its products to the consumer. The resources flowing through a channel includes a supplier, manufacturer, wholesaler, retailer, & consumer. The material flow originates with the supplier & ends with the consumer. Information that flow in the direction opposite to the material flow is called feedback information, & the flow of information toward the consumer is called feed forward information.
- **Promotion:** - It is composed of two principal areas: personal selling & advertising. Technology is vital to the selling effort in several ways: (a) typing in customers 7 suppliers; (b) increasing selling time; (c) increasing effectiveness of the client site; (d) identifying selling opportunities; & (e) making salespeople more efficient.
- **Price:**-Depending on the firm's pricing policies, the price area can run close to promotion

in terms of decision support difficulty. Some firms engage in cost-based pricing by determining their costs & then adding a desired mark-up. A less cautious pricing policy is demand-based pricing, which establishes a price compatible with the value that the consumer places on the product.

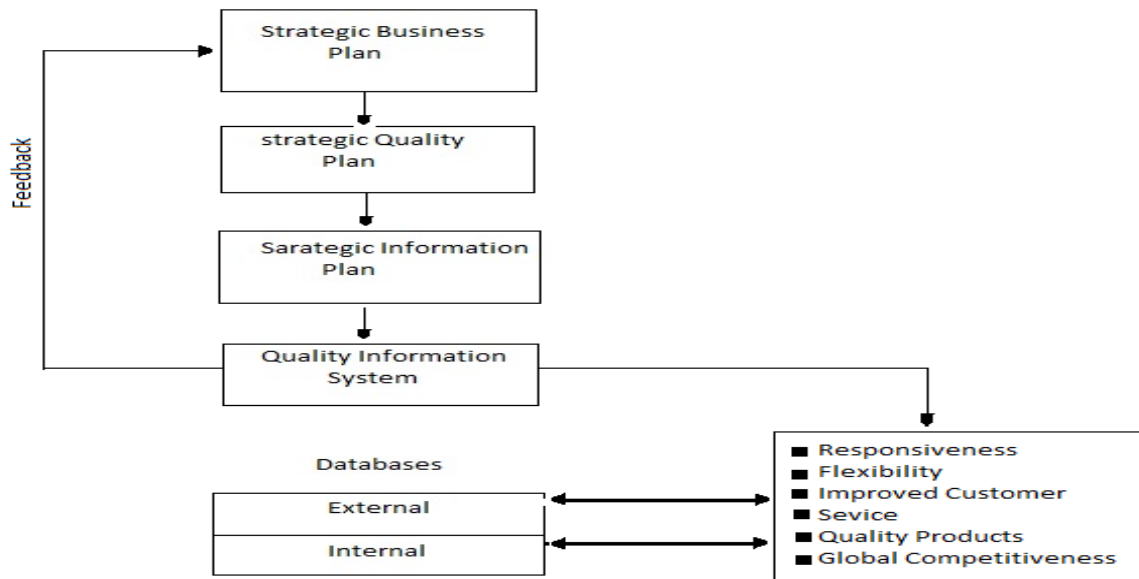
- **Budget allocation:-**Two other imp decision making areas, in addition to four Ps, are the allocation of the marketing budget & sales forecasting. Marketing does not have an unlimited source of funds. Thus, a budget must limit the overall size of expenditures.
- **Sales forecast:-**The sales forecast reflects estimates by the marketing personal on future product sales. Since it is the main source of firm's revenue, sales forecast is an important part of the financial plan. Many technology tools are also used in sales forecasting.

### 10.4.3. Advantages of Marketing Information Systems

A good marketing system provides employees with information that helps firms capture niche markets in highly competitive industries. Marketing system has a deep & directed influence on the quality of customer's service. Hence, it is seen that competitive intelligence is of interest to the firm as a whole. Although the name of the functional information implies that is only for managers in that area, the information output can be of value to other management & executives as well. Hence, marketing information system play a vital & critical role in helping an organization achieve its goals.

## 10.5. QUALITY INFORMATION SYSTEMS

- Quality information systems are standalone system or embedded system that helps an organisation to achieve its quality goals. The quality plan is derived from the strategic information plan.
- The below figure has shown how the strategic quality plan is derived from the strategic information plan. In some cases, a firm has no separate quality plan, but instead makes quality a component of other plans, such as marketing, manufacturing, and so on.
- The information system (IS) department plays a major role in ensuring the success of TQM effort in an organisation. An information system can promote quality and provide tools and techniques to help the firm achieve its quality goals. Information system also helps firms achieve quality certification. There are many institutions and agencies that certify the quality efforts of an organisation and provide guidelines to firms that plans to instill quality in all aspects of their operations.



Quality Control Information System In an Organisation

- The role of IS may vary from one organisation to the next, or even from one program to the next, but there are four major areas where IS plays an important role in the certification process. They are: **partial systems overhaul, full systems overhaul, training and oversight.**

**Partial systems:-**It is overhaul, existing systems are partially revamped in order to update them and make them more responsive to the changing needs of decision makers. Partial systems overhaul may include providing users with better interfaces, better end-users support, or better integration of existing systems.

**Full systems:-**This systems overhaul, the old system is replaced with a new system. This may sometimes be necessitated by outdated equipment or systems that can no longer be update or maintained.

**Training:** It is another area where IS can play an important role in quality certification. Users must be well –trained in systems that are partially or fully overhauled, because this has direct impact both on quality and productivity. More important, good data come from well-trained users and good data from the basic of good decisions.

**Oversight:** It is the entire quality certification process; this is often a time-consuming task. It requires coordination and cooperation among departments; IS can play a facilitating role by ensuring the free flow of information between decision makers. Often, organisational data and information have to be sent to external agencies and IS plays a critical role in getting the right data to the right people at the right time.

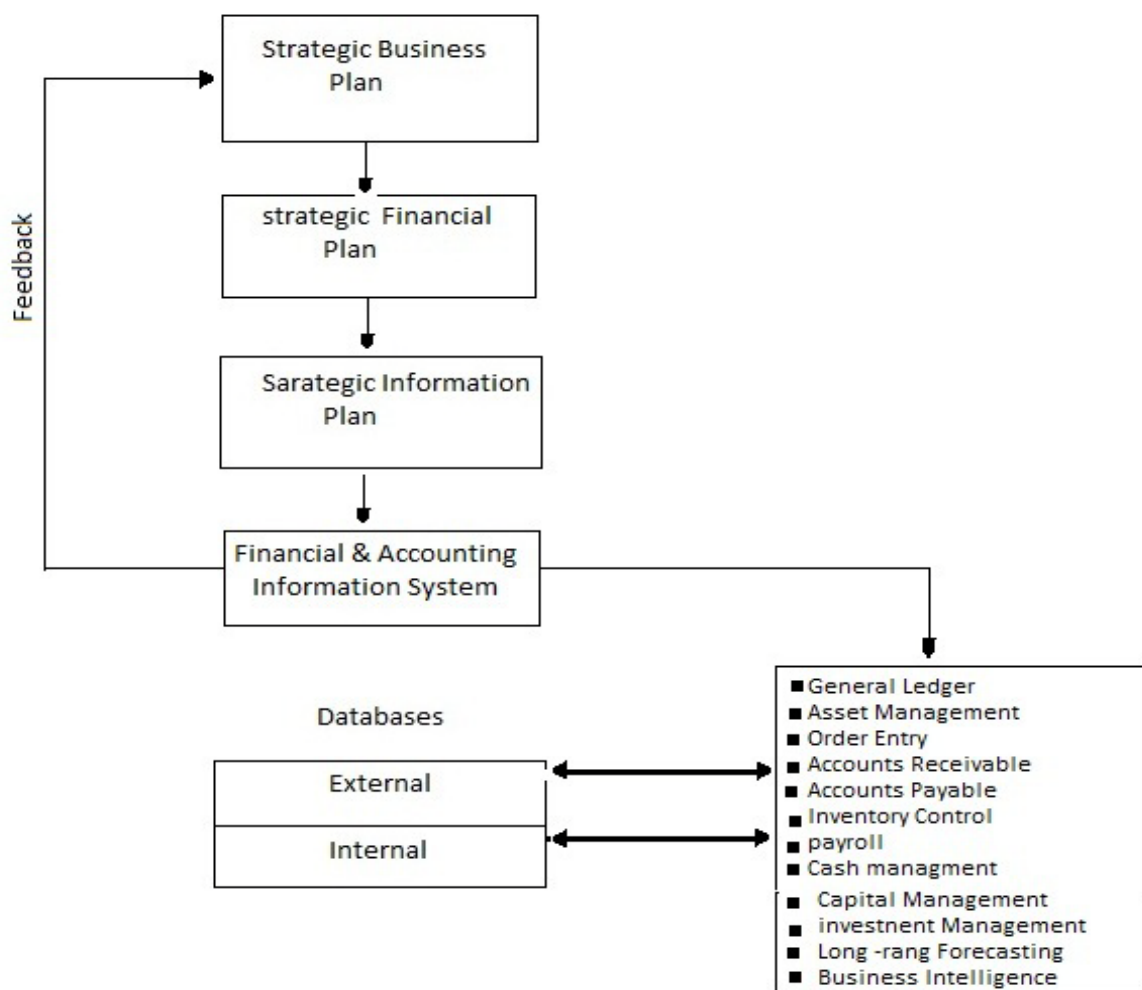
### 10.5.1 Advantages of quality information systems

The aim of most firms all over the world is to produce high-quality goods and services; information is essential to achieve this goal—accurate, timely, and reliable information. Achieving quality also involves being able to develop strategic alliances with suppliers and customers, and information is again essential to this process. A high-quality car manufacturing firm in Indian has developed a quality information management system (QIMS) to achieve its

quality goals. The system highly integrates information generated on the shop –floor, for instance about defective auto parts, so that decision makers can take immediate action to correct the situation. Managers have changed from data collectors to quality enforcers, since now they can take proactive action to keep the firm on the quality track.

## 10.6. FINANCIAL AND ACCOUNTING INFORMATION SYSTEMS

Financial and accounting information system (FAIS) is a system that provides information related to the accounting and financial activities in an organisation. It includes budgeting, cash and asset management, capital budgeting, portfolio analysis, general ledger, accounts receivable, inventory control, and payroll systems. Other systems include record keeping, account analysis, cash management, financial analysis, leasing options, insurance claims processing, and investment management. Financial institutions, such as banks, use specialized FAIS, such as commercial loan analysers, credit approval systems, commercial account rating systems, credit application systems, automated teller control, and securities trading. Other institutions and farms may have their own specialised FAIS sub systems. Regardless of the type and number of subsystems, financial and accounting subsystems work together to create, record, generate, and disseminate financial and accounting information vital to good decision making.



Financial and Accounting Information System with its Sub System

Shown above Figure how the financial information plan is derived from the strategic information plan and the strategic business plan. Although most financial and accounting managers operate under the 'tyranny of the urgent', a strategic financial plan and an integrated set of information systems support the plan are a necessity for the survival and growth of any organisation.

### 10.6.1. Types of financial and accounting information systems

Various functions of FAIS are

1. **General ledger system** generate the firm's income statements and balance sheets and are responsible for managing new and old accounts in the firm.
2. **Asset management systems** maintain an inventory of the firm's long-term assets and ensure that accounting practices for firm assets comply with regulatory standards. The output of this system often becomes input to the general ledger system.
3. **Order entry systems** capture and manage different kinds of data relating to a transaction, such as number of units sold, customer billing, credit history, sales tax, and inventory levels. The output of this system is input to a number of other systems, such as accounts receivable and inventory management.
4. **Accounts receivable and accounts payable** capture and process data, such as creditor and customers billing information, payments received and owed, credit terms, account balances, and payment schedules.
5. **Inventory control system** captures, processes, and manages all data related to the firm's inventory, such as items in inventory, inventory levels and costs, accounting practices related to inventory maintains, stock balance, and data on lost, damaged, or returned goods.
6. **Payroll systems** capture and process data related to wages and salaries, including central and states taxes, other payroll deductions, employee benefits, overtime, and related data.

These systems are designed to support mostly operational decisions. These are

1. **Cash management systems.** Systems that ensure that the organisation has enough cash to conduct normal business, to receive the best possible return on its short-term cash deposits, and to leverage its cash flow to achieve good ratings in financial markets.
2. **Capital budgeting system.** Systems that ensure the acquisition and disposal of capital assets, such as land, buildings, and so on.
3. **Investment management systems.** Systems that ensure that the organisation to facilitate gets the best possible returns on its long-term investments.

### 10.6.2. Integrated Financial and accounting systems

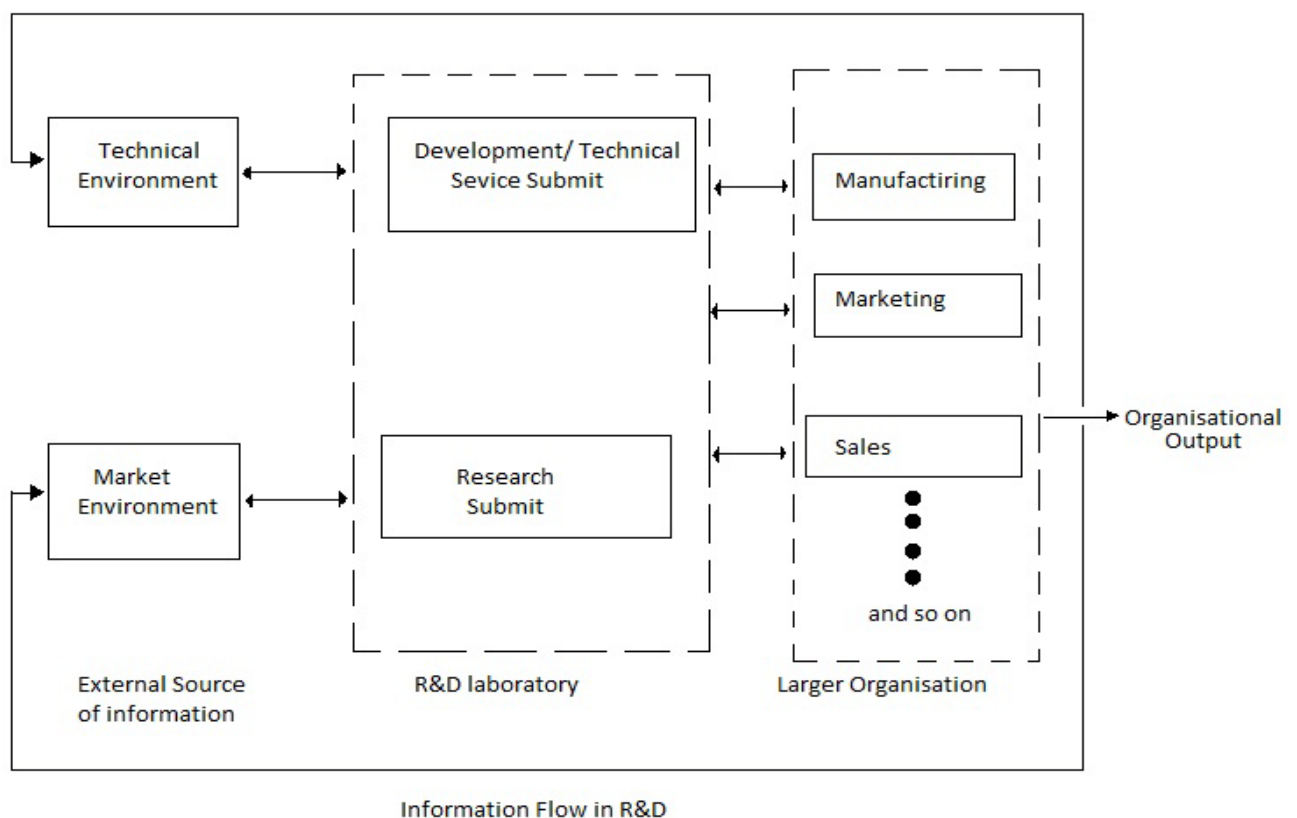
- FAIS are often integrated with other functional systems in the organisation to facilitate data sharing and team decision making. After all, financial decisions are not made in vacuum; they often involve marketing, manufacturing, and human resources. Thus, a free flow of information among these units is vital for good decision making.
- A radically different form of accounting, called ABC accounting, is helping firms integrate financial information with other system. The activity-based costing (ABC) accounting

system assigns overhead costs based on actual resources. A key benefit of ABC is that it allows a firm to determine the true cost of a product and the cost of serving a customer.

- This system is simple but highly information intensive. Instead of viewing the business as a collection of salaries and machines, ABC views it as a collection of processes or activities, and calculates the cost of each process or activity. These calculations are made by integrating information from different sources, such as the firm's general ledger and time-keeping systems. Determining the true cost of a product is the first step toward increasing profits and a FAIS can help a firm achieve this goal.

## 10.7. RESEARCH AND DEVELOPMENT INFORMATION SYSTEMS

- R&D is responsible for creating and developing new products or services in order to capitalise on recognised opportunities. R&D may also be responsible for overcoming recognised weaknesses in current organizational production and operation processes in order to make them more efficient, cost effective, and competitive.
- Because of this mandate and the potential of R&D to provide the organisation with competitive advantages, many researchers suggest that R&D information system should be considered to be strategic information systems.
- R&D is an open system that has important information and communications exchanges with the external environment and other organisational subunits. Figure shows the major information flows crucial for R&D effectiveness.



- This above figure suggests that strong linkages should exist between R&D and the external environment; it also suggests that solid links should exist between R&D and the

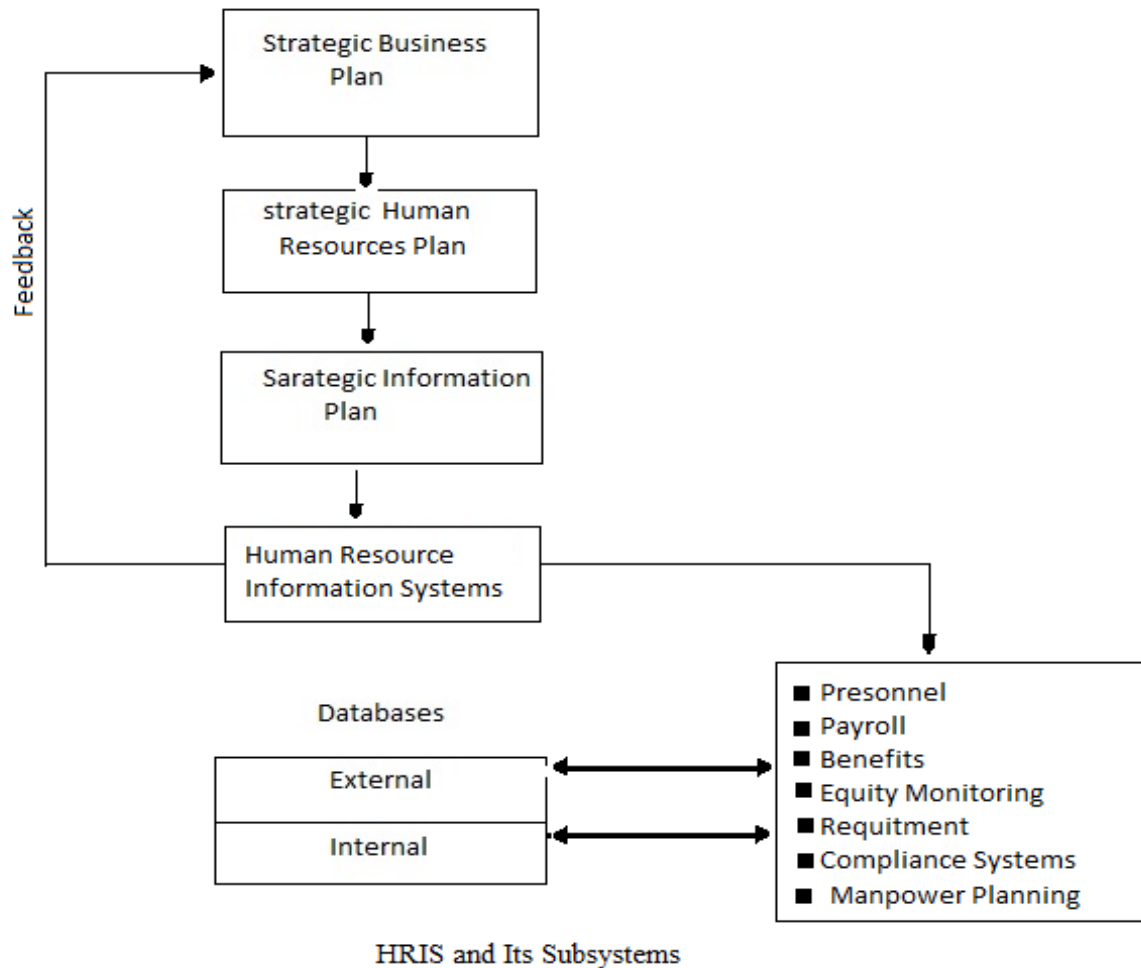
marketing/production subsystem of the organisation.

- In most organisations, the proportion of spending on information technology for R&D is increasing and that integrated laboratory information management systems are gaining in popularity.
- The productivity of R&D professionals has increased because of these changes, resulting in reduced product development times.
- Also, the access to external database and to other sources of external information has increased dramatically over the past few years. However, linkage between R&D subunits that have on-line access to marketing or production databases is far from the expected level.

## **10.8. HUMAN RESOURCES INFORMATION SYSTEMS**

- Human resource information system (HRIS) is a system that supports the planning, control, coordination, administration, and management of an organisation's human resources.
- HRIS also include a large number of subsystems that address the information needs of various human resources functions. They provide managers with information, policies, and procedures concerning recruiting, layoffs, employee evaluation, promotion, termination, transfer, salary equity monitoring, job descriptions and responsibilities, training, affirmative action plan (AAP), and equal employment opportunities (EEO) .
- HRIS also facilitate vital information on matters such as payroll, central and state taxes, health benefits, child care, grievance procedures, and other personal information that affects employees personal and professional lives, it is imperative that these systems be highly responsive to employee needs.
- Human resource systems were slow to be computerised in 1960s. However, in 1990s, many organisations begin to realise the importance of HRIS. It is estimated that by the year 2000. HRIS will be a necessity for most of the big giants if they are to keep up with increasing government regulations and respond to personal information queries about employees.





## 10.9 GEOGRAPHICAL INFORMATION SYSTEMS

- A geographical information system (GIS) is a computer-based system that stores and manipulates data that are viewed from a geographical point of reference.
- This system has four main capabilities: data input, data storage and retrieval, data manipulation and analysis, and data output.
- A GIS is one of the powerful and versatile tools as it can create information by integrating different data, sometimes from different sources, and display the data in different ways to the end-user.
- Geography plays an important role in many business decisions, since 85% of corporate data involve a number of business decisions, such as store locations, sales territories, sales promotions, and regulatory compliance rely heavily on geographical data.
- The number of business applications of GIS has grown significantly in the last few years. For example, a GIS allows a bank to compare deposits with loan approvals in a given area and show that loan approvals meet regulatory standards in areas with deposits.

## 10.10. CROSS FUNCTIONAL SYSTEMS

- Cross-functional system that facilitates the flow of information among all units in an organisation. Decision-making should not be compartmentalised in functional areas, but should instead be viewed in the context of the entire organisation.



- The close link between information systems and the various functional units in the organisation emphasizes the fact that students, regardless of their area of specialisation, should be well grounded in information systems and technologies. In the coming years, computer skills will be grouped with the basic skills of reading, writing, and arithmetic, and computer-literate individuals with a good understanding of information systems will be eagerly sought after by employers.
- The various types of information systems form the backbone of the functional information systems. The types of functional system depend on the nature, scope, and complexity of the task. If the task is routine, structured, involves transactional data, and is related to operational decisions, whether in finance, accounting, marketing, manufacturing, or human resources, the system is likely to be transaction processing system. Summary and exception reports for different functional areas are likely to be generated by a management information system.
- For example, a report of the number of people who worked over time last month (human resources) or the number of machines operated during the night shift last month (manufacturing) are often the output of an MIS.

# CHAPTER-11

## SYSTEMS ANALYSIS AND DESIGN

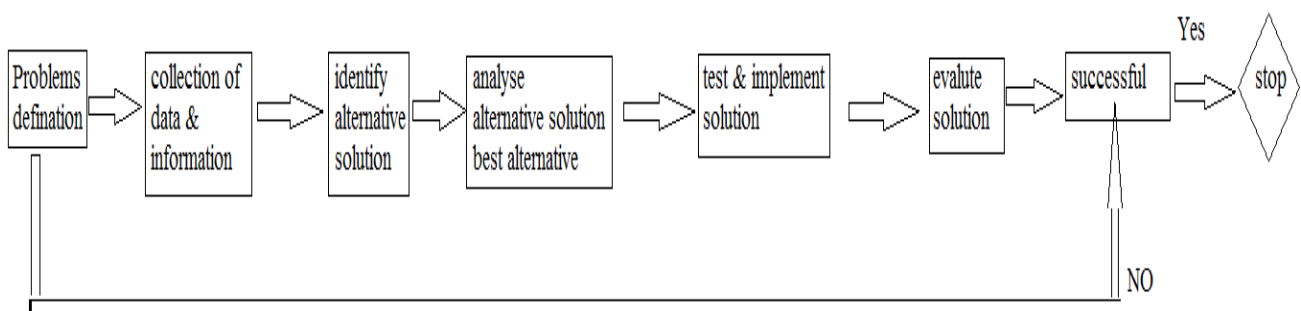
### 11.1. INTRODUCTION

- Systems analysis is an important activity that takes place when new information systems are being built or existing ones are changed.
- It includes collection of necessary data and developing plans for new systems.
- **System Analysis:-**The investigating into system operation and possible changes to the system is called the system analysis.
- There are 6 types of information system development methodology are used.
- These are:-
  - **SDLC (System Development Life Cycle).**
  - **Prototyping.**
  - **Rapid action development.**
  - **End-user development.**
  - **Software packages.**
  - **Out sourcing**

### 11.2. SYSTEM DEVELOPMENT LIFE CYCLE (SDLC)

It consists of 5 phases:-

- a) Problem definition.
- b) System analysis
- c) System design & programming
- d) System testing & implementation
- e) System maintenance



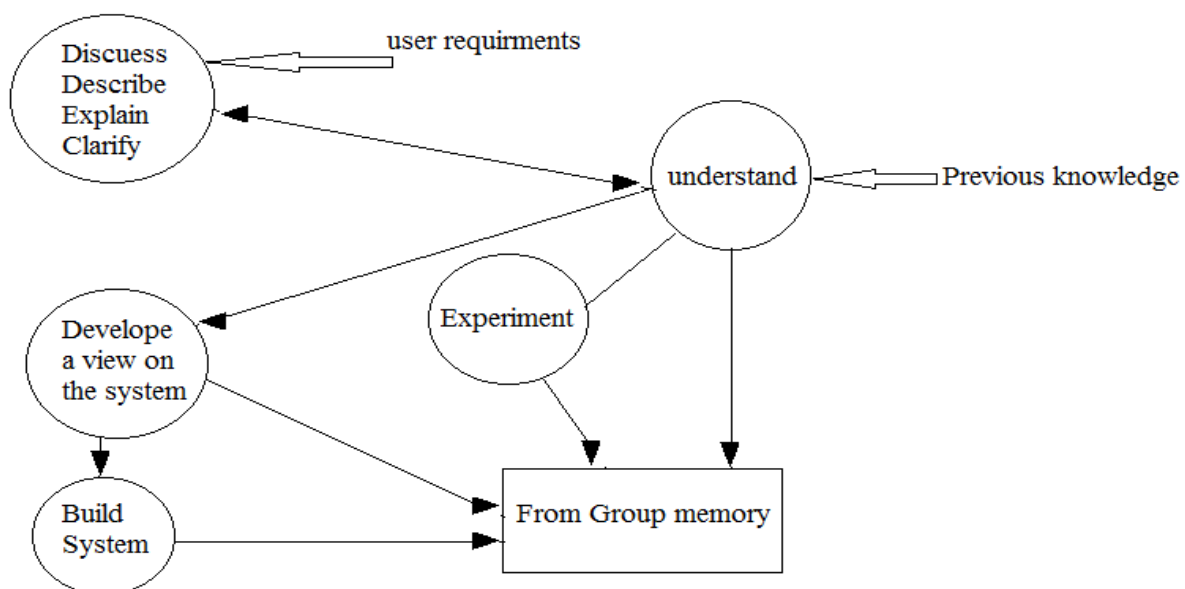
#### 11.2.1. Problem Definition

- ❖ It is the process of defining the current problem, determining why a new system is needed and identifying the objectives of the purposed system.

- ❖ The main aim in the phase is why do we need a system and what are the objectives of the new system.
- ❖ The first question identifies the existing system and elaborates on how these problems can be eliminated by developing a new system.
- ❖ The second question identifies the primary goals of the system and establish system boundary is which are necessary to prevent the project from becoming a moving target or grueling too large & complex to be successfully completed.

### 11.2.2. System Analysis

- ❖ In this phase the detail problem analysis is undertaken to better understand the nature scope, requirement, and feasibility of the new system.
- ❖ Main activities in this phases are:-
  - Understanding the problem
  - Feasibility analysis
  - System requirement
- **Understanding the problem**
  - ❖ In this phase developers & user should fully understand the existing problems & the strength & weakness of the system.
  - ❖ It include identifying the overall implications and benefits of the new system for the entire organisation, taking an inventory of existing hardware and software and identifying the information needs of existing and potential users.



**Fig: Some Activities in Problem Solving**

#### ➤ Feasibility Analysis

There are 6 types of feasibility Analysis

##### 1. Technical feasibility

It determines the system can be developed & implemented using existing technology or new technology is required. Hardware, Software and network requirements are also determined.

## 2. **Economic feasibility**

In this analysis evaluates the financial aspects of the project by performing a cost benefit analysis and accessing both tangible & intangible here benefits of the system.

## 3. **Operational feasibility**

It is determines, there will be any problems in implementing the system in its operational environment and access how the system fits with the strategic business plan & strategic information plan of the organization.

## 4. **Schedule feasibility**

It is study the time it will take to complete the project, taking into consideration available resources & additional resources required if any.

## 5. **Legal feasibility**

It takes into account factors such as copyrights, patents and state regulations.

## 6. **Strategic feasibility**

It looks the ability of the system to increase market share, give the firm a competitive advantage in the marketplace, and enhance the productivity of the knowledge workers.

### ➤ **System requirements**

- ❖ In this phase system specification are identified by asking who, what, where, when & how.
- ❖ Some questions addressed during this phase
  - Who needs the system and for what purposes?
  - What are the needs of the system?
  - Who will receive system be delivered?
  - How or in what type of format should the output be delivered?
  - Who are the users?
  - What are the maintenance requirements of the system?
- ❖ Therefore, establish various functions of the new system so that it can achieve the objectives established in the problem definition phase.

## 11.2.3. System Design and Programming

- ❖ System design is the determination of the processes and data that are required by a new system.
- ❖ There are two types of design exist. These are:
  1. **Logical design.**
  2. **Physical design.**
- 1. **Logical design:**
  - It is identifies the records and relationships to be handled by the system.
  - It focuses on the reasoning by breaking down the system into subsystems and each subsystem into smaller subsystems, until the process cannot be further repeated.
  - It establishes the relationships among various subsystems, the records and variables in the subsystems and interrelationships among variables and subsystems.
- 2. **Physical design:**

- Physical designs proceed after logical design is completed.
- Physical design involves three main activities. These are: To know the technology required to implement the system,
- To ensure that the design is rigorous and reliable; and to provide detailed specifications and system objectives.
- It has 2 steps:
  - An initial broad-level design.
  - A detailed design:
- It starts only when a broad solution has chosen. In this phase, the database and program modules are designed and details user procedures are documented.
- ❖ **System development**
- The individual system components are built during the development period. Programs are written & tested end user interface developed & tried by user.
- The database is initialized with data.

#### 11.2.4. System Testing & Implementation

- ❖ It is most difficult tasks in system development; it requires creativity, persistence and a thorough understanding of the systems.
- ❖ It involves thoroughly probing the system to ensure that its performance matches system requirements and meets the expectations of end-users.
- ❖ There are 3 types of testing:
  1. **Unit testing.**
  2. **System testing.**
  3. **Acceptance testing.**
- ❖ In **unit testing** a system is viewed as a collection of program & each program is individually tested without any assurance that the system is free of errors.
- ❖ In **system testing** it is performed as the entire system to ensure that its component units (system) will function effectively when brought together as a system.
- ❖ In **acceptance testing** it is developers & users test the system under actual or simulated operating conditions to ensure that it is acceptable to users.

#### Implementation

- ❖ A good system prevails when it is implemented without affecting the routine operations of the organisation.
- ❖ This requires careful planning & coordination.
- ❖ In case the system is new implementation is quite straightforward. If the system is replacing an existing one implementation becomes critical. In such a case there are 4 types of conversion strategy:-
  - Parallel conversion
  - Direct cutover
  - A pilot study
  - A phased conversion

### 11.2.5. System Maintenance

- ❖ It ensures that it continues to meet the growing and changing needs of users through system modifications when it requires.
- ❖ It starts after the system becomes operational and should last as long as the system is in use.
- ❖ It is the key to continuing to drive the maximum benefits from a system.
- ❖ User requests for new features or for enhancement of existing facilities changing business climate, new technology, or new information needs within the organisation can accelerate system maintenance.
- ❖ Maintenance cost usually increases with time and when it is more expensive than to develop a new one. The organisations most decide to abandon the existing system and build a new system.
- ❖ It is basically formed for 3 reasons:-
  - To correct errors.
  - To keep system current.
  - To improve the systems.

## 11.3. PROTOTYPING

1. It is the approach where systems are developed swiftly, without having undergone a complete analysis & specification. The system i.e. developed is known as the prototype.

### 11.3.1. Types of Prototypes

- ❖ There are 2 types of prototypes used:
  1. Discardable prototype.
  2. Operational prototype.
- 1. Discardable prototype:**
  - ✓ Identify user needs.
  - ✓ Develop a prototype using one or more prototyping tools.
    - There are 2 types of tools:-
      - 1. Integrated application generators (IAG):**
        - It is a prewritten software system i.e. capable of processing all of the desired features in the new system. ( menus, reports, screens, a database and so on.)
      - 2. Prototyping tool kits:**
        - It includes separate s/w systems each capable of producing a portion of the desired system features.
  - ✓ Determine if the prototype is acceptable
  - ✓ Code the operational system
  - ✓ Test the operational system
  - ✓ Determine if the operational system is acceptable
  - ✓ Use the operational system.
- 2. Operational prototypes:** For developing this prototype:

- ✓ Identify user needs.
- ✓ Develop a prototype using one or more prototyping tools.
  - There are 2 types of tools:-Integrated application generators (IAG):
    - It is a pre written software system i.e. capable of processing all of the desired features in the new system. (Ex: menus, reports, screens, a database and so on.)
  - Prototyping tool kits:
    - It includes separate s/w system each capable of producing a portion of the desired system features.
- ✓ Determine if the prototype is acceptable
- ✓ Use the prototype
 

This approach is possible any when the prototyping tools enable the prototype to contain all of the essential elements of the new system.

#### 11.4. RAPID APPLICATION DEVELOPMENT (RAD)

- A methodology that has the objective of speedy response to user needs as does prototyping but it is broad in scope is called RAD.
- It is a team coined by James Martin, computer consultant & author for a developing life cycle intent to produce systems quickly without sacrificing quality.
- It is an integrated set of strategies, methodologies and tools that exists within an overall framework called information engineering.

##### 11.4.1. Essential ingredients of RAD

- RAD requires 4 essential ingredients. These are
  1. Management
  2. People
  3. Methodologies
  4. Tools
- 1. **Management**
  - It is particularly top management.
  - It should be experimenters, who like to do things in a new way, or early adapters, who quickly learn how to use new methodology.
  - Management should be fully supportive of RAD & provided a works environment that makes the activity as enjoyable as possible.
- 2. **People**
  - RAD recognised the efficiency that can be achieved through the use several specialized teams.
  - There can be teams for requirements planning, construction, user design, user preview and cutover.
  - Member of these teams are experts in methodology and tools that are required to perform the specialised tasks.
- 3. **Methodologies**
  - RAD life cycle which consists of 4 phases.

- Requirement planning, User design, Construction, Cutover.
- These phases like the SDLC. It is reflect the systems approach.

#### **4. Tools**

- Tools consist of fourth generation language & computer aided software engineering tools that facilitate prototyping and code generation language.

### **11.5. END USER COMPUTING**

- ❖ End user computing is a situation in which the end user of an information and decision support system is involved in the design, development, and maintenance and use of the system & its applications.

#### **11.5.1. Types of End –User Computing**

- ❖ There are 2 Types of end user computing:-

1. Skills of end user
2. Maturity of end user computing

##### **1. Skill of end users**

- There are 6 categories & end user may progress from one category to another. Each is distinguished by a different type of skill & information requirement. Recognition of this will add end user management are:

- Non-programming end-user
- Command level end user.
- Programming level end user
- Functional support personal
- End user support personal
- Data processing programmers

##### **2. Maturity of end user computing**

- There are 5 stages in which the degree of integration of the application which taken as the measure of maturity.
- Isolation
- Stand alone
- Manual integration
- Automated integration
- Distributed integration

#### **11.5.2. Managing End-User Computing**

- There 3 essential activates in managing end user computing.
- 1. Coordination
- 2. Support
- 3. Evaluation

##### **Coordination**



- It is the vital to develop an integrated information environment within the organization and to ensure that all end user fallows standard development policy & procedure. For this, hardware & software, networks, application personal and other resource associated with end user computing must be carefully coordinated, controlled, and managed.

### **Support**

- Supporting end user involves providing all the resources that they need to develop manage implement, and maintain information system.
- This includes problems & system selection providing back up for application and system hoping. With system development, ensuring that all systems are properly documented, facilitating error resolution, providing information on resources available within organization ensuring that system are properly maintained and secured in providing necessary training.

### **Evaluation**

- It provides managers with in the information needed to resolve the supporting and controlling, facilitating and restricting, enabling and disciplining, nurturing and regulating, festering and restoring end users.
- All the evaluation mechanism must take into account for this purpose.

## **11.6. SOFTWARE PACKAGES**

These are design for the specific task such as word processing; financial analysis, inventory control, scheduling, and payroll system are available to develop information system. These s/w packages ranging complexity from very simple to highly suffocated system.

## **11.7. OUTSOURCING**

- It is the hiring of outside professional services to meet the in house need of on organization.
- In information system out sourcing means using external agencies to create, process, manage and maintained information system and provide the form with a wide range of information related services.
- Organization out source for reason that can be classified in to 4 categories:
  - 1) Strategies forces
  - 2) Economic of scale
  - 3) Market forces
  - 4) Technical consideration

## **11.8. COMPARISON OF IS DEVELOPMENT METHODOLOGIES**

### **SDLC:-**

Characteristics:-

1. traditional development approach
2. Sequential step by step approach
3. Five phases.

Advantages:-

1. Suitable for large projects
2. Provides structure and control

Disadvantages:-

1. Expensive

2. Time-consuming
3. Inflexible
4. Limited role of users

### **PROTOTYPING:-**

Characteristics:-

1. Iterative methodology
2. Based on building a working model

Advantages:-

1. High user emphasis
2. Promotes teamwork
3. Reduces wastage
4. Flexible

**RAD:-**Speed response to user needs and broader in scope.

**OUTSOURCING:-**It is vendors provide full or partial IS related .

## **11.9. OTHER TOOLS FOR INFORMATION SYSTEMS DEVELOPMENT**

- ❖ There are 3 important tools are used in system development
  1. Communication.
  2. Experimentation.
  3. Prediction.
- **Communication tools** helps end users and to developers communicate effectively with each other and are specially use full in representing system specification.
- **Experimentation tools** allow developers to experiment with different design and development approach & earned by trial and error.
- **Prediction tools** are design to help users & developers predicate the impact of a new system. On a firm including the system financial & human resource implication and its effect on computation.

## **11.10. COMPUTER AIDED S/W ENGINEERING (CASE)**

- It is a category of s/w for transforming some of the system development workload from human developers to the computers.
- There are many CASE s/w available in the markets that accomplish these objectives to various degrees.
- The range of particular tool capabilities can be expressed in terms of where it fits in the SDLC.
- There are four types of tools.

### **1. Upper CASE**

It can be used by the firm's executives when they engage in strategic planning. Example is information engineering work station from knowledge ware.

### **2. Middle CASE**

A middle case tool can be used during the analysis and design phase to document the processes and data of both the existing and a new system. Example: - visible analyses from visible system.

### **3. Lower CASE**

A lower case tool is used during the implementation and use phases to have help the programmer develop, test and maintain code. These tools are referred to code generator.

#### **4. Integrated CASE**

An integrated case tool offers the combined coverage of the upper, middle and lower case tools.

### **11.11. CHALLENGES IN DEVELOPING INFORMATION SYSTEMS**

There are two types of challenges in system development in most of organization.

1. Backlog
2. Runaway project

#### **❖ Backlog:-**

- It occurs when the development of an information system has been delayed because lack of resources.
- In many organizations backlog continuous to grow at a rapid rate.

#### **❖ Runaway projects:-**

- These are the projects that are behind schedule and over budget.
- It is a universal problem.
- Runaway projects are the result of poor management then of technological complexity

#### **❖ Reasons for success of developing IS project are:-**

1. User involvement.
2. Executive management support.
3. Clear statement of requirements.
4. Proper planning.
5. Realistic expectations.

#### **❖ Reasons for failure of developing IS project are:-**

1. Lack of user input.
2. Incomplete requirement and specifications.
3. Change in requirement and specifications.
4. Lack of executive support.
5. Technological incompetence.

# CHAPTER-12

## STRATEGIC MANAGEMENT INFORMATION SYSTEM

### 12.1. INTRODUCTION

- Strategic management information system (SIMS) is the set containing systems considered critical to the current or future business competitiveness and hence survival of an organization.
- An SMIS also supplies and organization with business intelligence. If an information system is used in creative ways to achieve the goals and fulfill the mission of the organization, it can be viewed as an SMIS whether it is TPS, an MIS, or any other type of system.
- Strategic management information system can be external or internal system.

#### 1. External Strategic system

- These are used mainly by external entities in the business environment, such as customers, suppliers, and distributors, and have a value-added component that gives developers some time to reap the benefit of system innovation.
- Some benefits of external strategic system are two fold:
  - **Benefits to the customer**—increase customer satisfaction, increased customer control, and reduction in transaction cost ; and
  - **Benefit to the organisation** – increased market share, reducing of the processing cost, ability to charge higher price because of value-added component, and increased in profit margins.

#### 2. Internal Strategic System,

- These are used by employees within the organisation and do not have a value-added component. The employees focus on the issues such as improving the quality of products and services and enhancing the decision making capability of manager.
- Such systems are often used at all levels in the organisation; they have long term implications for the firm and for the business process within the firm.
- Strategic information systems can be divided in three categories
  - System that focus on innovation for competitive advantage.
  - System the use information as a weapon.
  - System that increase productivity and lower the cost of goods and services.

#### **Innovation**

- Customer service systems
- Order, order inquiry, service systems
- Marketing planning systems
- Forecasting sales analyses

#### **Information services**

- Financial planning systems
- Systems with mathematical models to aid financial planning
- Executive information systems

- Systems that allow top management to retrieve internal and external data and information directive form the computer.
- Logistics
- Vehicle routing, freight rate management, shipment tracing, performance measurement
- Electronic data interchange (EDI)
- Electronically sending bills, payments, or orders to suppliers and customers
- Access to external data bases
- Compustat, CompuServe, Dow Jones, and so on;
- Expert systems
- Computerized “consultant” systems for specified situations.

### **Productivity**

- Transaction processing accounting, billing, pay roll
- Inventory management
- Raw material, finished product work-in process
- Centralised DBMS
- Software system to facilitate access to organizational data and information
- Production planning
- Material and capacity requirements planning, scheduling, due date setting
- Personnel system
- Skills inventory and personal performance tracking
- Statistical system
- SAS, SPSS, Minitab, and so on.
- Factory floor control
- Robotic islands, automated guided vehicle systems, automated storage and retrieval

## **12.2. CHARACTERISTICS OF SMIS**

There are three common characteristics in all strategic management information systems. These are:

- ❖ Telecommunication as central part of SMIS.
- ❖ Reliance on a number of vendors for providing information technologies.
- ❖ Cooperation among a number of organisations.

**Telecommunication:** - It is a vital part of SMIS. The successful organisation transcended traditional organizational boundaries and eliminated the barriers of time and space through the use of telecommunication. However, developing and implementing information system that rely heavily on telecommunication is a challenging task and is often becomes one of the bottlenecks for development of SMIS.

**Interorganaisational systems:-** Those systems which are shared by more than to organizational, in terms of cooperation and collaboration rather than the competition. Such ventures often results in powerful systems enhancing productivity, reduction in cooperating cost, increased market share, and create new partnership specially for organisational that the conduct business transaction in global markets.

## **12.3. STRATEGIC PLANNING FOR MIS**

An organisation’s IS strategy, and the plan that document it, must be consist with:

- Its corporate plans
- Its management's view of the role of IS in the organisation
- Its stage of maturity of use and management of IS

For strategic planning of MIS, following five questions should be addressed:

- Where does IS strategic fit with in the wider set of strategic?
- What has been the history IS strategic planning?
- What circumstances demand major re-assessment of IS strategy plans?
- Who might be the employed to the actual planning?
- What might an IS strategy plan contain?

## 12.4. DEVELOPMENT OF SMIS

- An organization should ask two questions before developing a SMIS.
  - Is the project financially feasible?
  - Is the project technically feasible?
- Strategic system required substantial resources over an extended period of time, often with little or no guarantee of success.
- The primary reason why strategic system is risky financial ventures is that they are often ground-breaking system with few or on procedure, so they must be justified on the basis of the business strategy they support.
- Justifying SMIS primarily by financial standards is often futile.
- **Technical feasibility of the project:** - Strategic system requires well established technology, which is also widely accepted by users. Sometimes the complexity of the technology can be hinder the success of the system. State-of-the-art technologies and untested technology can be added a new and unexpected twist to the development of the strategic system. Technical failures of strategic system can be even place organization at strategic disadvantages.
- **Key factors to success SMIS.** Following are the five factors that contribute to the success of a strategic system.
  - Technology decision should be grounded in a clear understanding of the process that drives the technology.
  - Strategic system should be driven by the strategic alliances between trading partners.
  - Continuous improvement and investment in strategic systems are essential for their long-term success.
  - The organizational culture should encourage some risk-taking.
  - Users must be fully trained if the full potential of the strategic system is to be aimed.

These techniques are known as three **Rs**—reverse engineering, restructuring, and re-engineering. These components can be applied separately or in combination.

### 12.4.1. Reverse Engineering

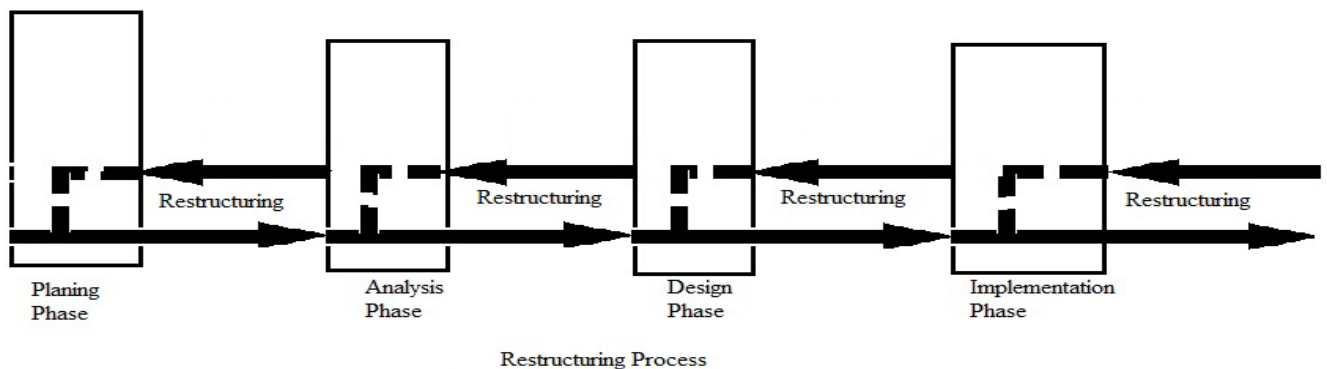
- Reverse engineering had its origin in business intelligence. firms keep current on their competitors products by purchasing samples and taking them apart to see what makes the product. The design specification of the competitors products are derived from the product themselves, reversing the normal pattern, where the design come first.
- Reverse engineering is the process of analyzing a system to identify its elements and their interrelationship, and to create documentation in a higher level of abstraction than currently

exists. *Reverse engineering* is applied to a system when little or more documentation exist and there is a need to prepare new documentation.

- The starting point in reverse engineering a system is the program code, which is transformed into such program documentation as structured English and program flow chart. This documentation can, in turn, be transformed into more abstract descriptions such as data flow diagrams and system flow charts. The transformation can be accomplished manually or by business process redesign software.
- Reverse engineering therefore follows a backward path through the system life cycle as illustrated in, reconstructing the system design and planning that went into the original development effort.

#### 12.4.2. RESTRUCTURING

Restructuring is the transformation of a system into another form without changing its functionality. A good example of restructuring is the transformation of a program written in “spaghetti code” into one in a structured format. Restructuring is pursued as a means of updating systems that developed prior to the advantage of structured techniques.

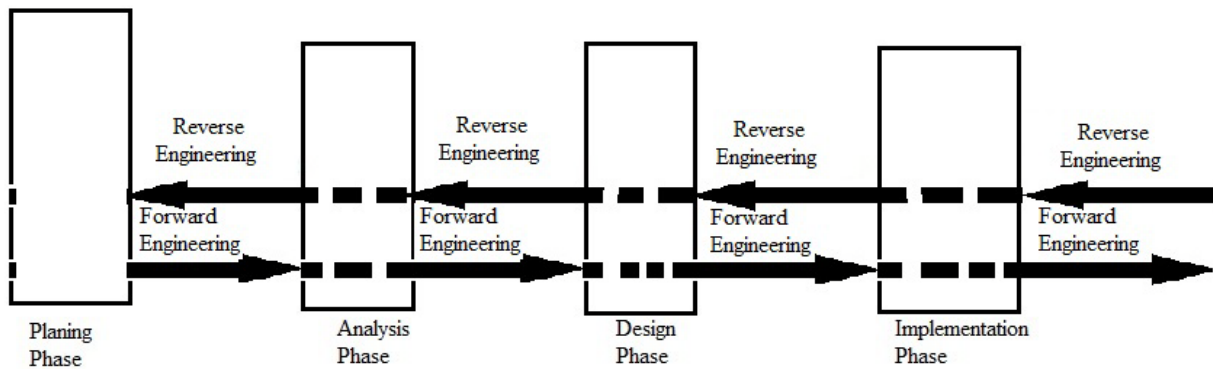


As soon as a program has been restructured it is put back into use, producing the looping patterned as the above figure as with reverse engineering, restructuring can be pursued in a backward direction through each phase of system life cycle. The result is a completely structured system- from the plan to the code.

#### 12.4.3. REENGINEERING

Reengineering is the complete redesign of a system with the objective of changing its functionality. It is not a “clean slate” approach because the knowledge of the way that the system currently performs is not completely ignored. The knowledge can be gained by first engaging in reverse engineering and then developing the new system in the normal manner.





Reengineering identifies the essential element of a core business process right across the organisation and sometimes beyond its boundaries.

- Identify the process of innovation
- Identify the change levers
- Develop the process vision
- Understand the existing processes
- Design the prototype the new process

Hence, it is necessary that construction investment in strategic system is valid to staying ahead of the compaction. The organizational culture should encourage top manager to be 'champion' and 'passionate sponsored' who are willing to play a key role in the development and implementations of SMIS and encouraged its use and acceptance by employees and customer. Finally, the organization should have a pool of talents people with technical skills and a good understanding of the business for the development of complex and sophisticated information system.

## 12.5. MIS STRATEGY IMPLIMENTATION

There are five major strategy implementation issues:

- information system resource structure
- end-user computing
- information systems management and hybrid managers
- information value and information systems investment
- Selection and acquisition.

## 12.6. BARRIERS TO DEVELOPMENT OF SMIS

### • Development (definition) barriers

- ✓ Generating workable ideas requires leadership and term work.
- ✓ Many innovative ideas are technically infeasible.
- ✓ Many innovative ideas are prohibitively expensive.
- ✓ Many ideas die because they lack a sufficient market.

### • Implementation barriers

- ✓ Telecommunications increases the complexity of implementing SMIS.
- ✓ Multiple systems are difficult to integrate.
- ✓ SMIS systems often require interorganisational cooperation.
- ✓ State-of-the-art technologies are difficult to implement.



- **Maintenance barriers**

- ✓ Competitors can copy SMIS.
- ✓ Unanticipated demand can overwhelm the usefulness of an SMIS.
- ✓ Applications can be expensive to maintain or enhance.
- ✓ High exit barriers can cause devastating losses.

Organisations with limited financial resources, technological sophistication, and organizational flexibility will likely face one or more of these barriers.

# CHAPTER-13

## INFORMATION RESOURCES MANAGEMENT

### 13.1. INTRODUCTION

The study of managing information and its allied components is referred to as information resource management (IRM). It requires a broad perspective on information, its user and its impact on the goals and the mission of the organisation. Various entities that influence and are influenced by, information, such as people, policies, procedures, products, and internal and external business entities, must collaborate for IRM to be effective. Following are the three perceptions that are shaping the way IRM is viewed by the organisation.

- Information technology is growing and changing rapidly. Expectations as to what information systems can do for an organisation have increased considerably in the last few years.
- Top management is satisfied, increasingly, with the poor returns and inadequate performance of information systems. As corporate resources become tighter, there is increased pressure to put exiting resources to better use.
- Information systems are no longer regarded as just an operational tool. Managers realise that if utilised creatively, IS can provide a strategic advantage that competitors find hard to overcome.

Information resource management refers to policies, principle and procedures that effectively manage all components of an organisation that collect, store process, retrieve and disseminate information.

#### **DEFINITION OF IRM:**

IRM can be defined as the planning, budgeting, organising, directing, training and controlling of information systems and its associated elements. The term encompassed both information and its resources, such as personalised, equipment funds, and technology. It is a multidisciplinary approach closely linked to the overall mission and objective of the organisation and permeates all aspects of the organisation's culture.

### 13.2. PRINCIPLE OF IRM

- The IS department should be liked managed like any other department of business.
- The main purpose of information system is to help the organization meet its goal and objectives.
- IRM is the responsibility of all managers, regardless of their discipline function.
- The commitment of the top management is the key to realizing the full potential of information resources.

### 13.3. IRM OBJECTIVES

There are basically four main objectives of IRM. These are:

- Utilization of information resource effectively to achieve the overall goals and mission of the organization.
- Monitoring inventory, document and other resource that creates, process, store, and

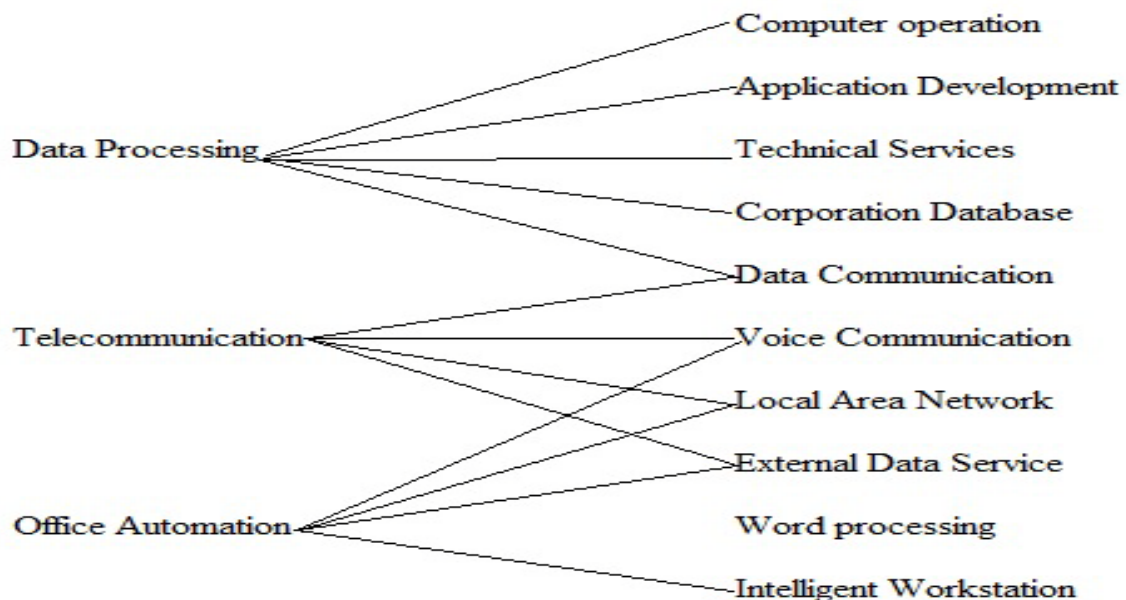
disseminate information.

- Develop a model of the enterprise from an information viewpoint in order to improve communication, both within and outside the organization.
- Aims to eliminate redundancy of information and increase the reusability of information already present within the organization.

### 13.4. FUNCTIONAL COMPONENTS OF IRM

There are basically three main components of IRM. These are:

- **Data processing.** In a traditional information system environment, information resources and synonymous with data processing. In organisations where information systems have a broader charter, data processing continues to play a signification role. Development of major applications, ongoing operations of ‘production’ systems, operations of the corporate data base, and cost control over major system expenditures are part of the data processing
- **Telecommunications.** Traditionally, data communications have been responsibility of data processing operations, while voice communications were assigned elsewhere. The advances in communication technology support corporate –wide telecommunications capabilities that integrate voice and data communications. Data communications are also an integral component of both data processing and office automation applications.
- **Office automation.** The components typically began as the word processing function under the responsibility of office administrators. Intelligent workstations integrate word processing with data processing and frequently involve access to the corporate database. Local area network and wide area communications are key components for interacting office automation function and providing access to data processing facilities.



Functional Components of IRM

### 13.5. ORGANISATION OF INFORMATION RESOURCE FUNCTION

There are a number of alternatives and centralisation of vs. decentralisation of information system functions because centralisation or decentralisation can be applied independently to the functions within information systems: system operations, applications system development, and overall planning and control. Also, centralisation vs. decentralisation should be considered absolute alternative but extreme point along continuum from highly centralize resource to highly decentralisation.

- **Factors for Centralised vs. Decentralised Control of Information Resources**

Many organisational units requiring information resources tend to prefer to have those resources directly under their control, thus encouraging decentralisation. However, there are other factors favouring a centralised authority.

- ❖ **Factors for decentralised control:** Following factors attributed to decentralised control of information resources.

- availability of low-cost technology
- backlog of development work
- user control over operations
- organisational behaviour
  - psychological value of unused information
  - Information is often collected and communicated to persuade.
  - Information use is a symbol of commitment to rational choice.

- ❖ **Factors for centralised control.** Following factors attributed to centralised control of information resources;

- staff professionalism
- corporate database control
- technical competence and research
- Comparative cost advantage.

### 13.6. APPLICATION OF SCARCE INFORMATION SYSTEM RESOURCES

An important management task is the allocation of scarce resources. In particular, here are more demands for information resources than can be provided in case of information systems. This will often be a part of the information system planning process, but allocation often takes place outside of formal planning.

### 13.7. MANAGEMENT OF INFORMATION SYSTEM PERSONNEL

Based on the growth rate in data processing and information systems jobs, one of the most difficult responsibilities of information systems managers has been to attract and retain competent employees. While some of the work of systems professionals may be shifting to users, recruiting and retention of technically, trained employees is still a major management task.

### 13.8. MANAGEMENT OF END-USER COMPUTING

The trend to end-user computing represents a significant shift to decentralisation of information systems resources. Following are examples of allocations of responsibility and authority:

- Decentralised end-user computing with no central coordination or control.
- Decentralised end-user computing with centralised responsibility for overall planning, major resource allocation, and enforcement of standards. Selection and training and technical specialities may also be centralised.
- The operation of a centralised information centre that provides analysis who go to users to work with them.
- The operation of a centralised information centre to which users come as needed for training and assistance.
- The operation of a centralised information centre and user in conjunction with centralised computer and centralised data bases. Access to the facilities of the information centre and the databases of the central computer is subject to centralised standard and procedures.

Three organisational issues important in the context of end user computing are: organisational policy and procedures for acquisition and use micro computer, end user software support, and the organisational of the information centre.

### 13.9. A PROACTIVE CIO STRATEGY

In most firms the CIO can exert much influence over his/her future based on the strategy that is followed. The CIO can face the challenges head on, and provide quality information support by following a strategy that consist of the following elements.

- Emphasize quality management of information resources by identify the quality needs of both external and internal information user. The external user exist in the environment of the firm in the form of the firms & customers, suppliers, stock holder etc.
- Achieve strong users ties by ensuring that IS object are compatible with those of users, and application of strategic value to the firm receive the highest quality support, and emphasizing joint application development.
- Strengthen executive's ties by becoming expert in the business of the firm and providing information support for the firm's executives.
- Assemble as IS management team that has the technical and managerial competence necessary to integrate information resources in user areas so that they form smooth functioning network.
- Assemble competent IS staff in leading-edge technologies and methodologies to provide user support superior to that which can be obtained anywhere else.
- Build an information service information system that enable the CIO and IS management to manage information resources in a dynamic, distributed environment.

# CHAPTER-14

## ENTERPRISE RESOURCE PLANNING

### 14.1. INTRODUCTION

Enterprise resource planning (ERP) is a software architecture facilitating the flow of information among different functions of an organisation.

The main features of ERP:

- A software architecture integrating all functions of a business.
- Integration is seamless. This is achieved through (a) common databases (b) instant being sufficient for the whole enterprise to get updated.
- Powerful, user-friendly GUI technology.
- Supported by client –server architecture for communication at different levels of the system.

### 14.2. ENTERPRISE MODELLING

Enterprise modelling is the most important prerequisite before the selection/implementation of an ERP system. It encompasses complete understanding and detailed mapping of the firm's business functions and decision making process, both independently and interactively. Enterprise integration leads to:

- More agile enterprise.
- Helps in eliminating redundant or non value added activities.
- More efficient system after being enabled by information technology.
- Streamlines five flows in an enterprise:
  - Information
  - Material
  - Money
  - Control
  - Intangibles, such as customer satisfaction and quality
- Empowerment of employees to take action.  
Based on Hansen (1991), there are five reasons which help in building the employees motivation due to integration
- When people understand the version, or larger task of an enterprise and are given the right information, the resources, and the responsibility, they will do the right thing".
- Empowered people-and with good leadership, empowered groups-will have not only the ability but also the desire to participate in the decision process.
- The existing of a comprehensive and effective communications network must distribute knowledge and information widely, embracing the openness and trust that allow the individual to feel empowered to affect the "real" problems.
- The democratization and dissemination of information throughout the network in all directions, irrespective of organizational position. Ensures that the integrated enterprise is truly integrated.

- Information freely shared with empowered people, who are motivated to make decisions, will naturally distribute the decision making process throughout the entire organisation.  
The integration of the enterprise helps in building an efficient and effective information network across the enterprise. Hoffman (1992) identified following reasons for integration.
- Identified of the major functions to be included in a program management organisation.
- Defining the scope and content of the information systems architecture and related metrics as a management guide.

### 14.3. ROLE OF INFORMATION TECHNOLOGY IN ENTERPRISE MODELING

Old system	Intervening Trend	Emerging Paradigm
Role of information is very limited	Information system designs, computerization of major activities, automation.	Seamless integration of enterprise through IT support
Manual analysis of data MRP	Computerization and networking MRP II	Integrated network of systems open loop MRP ERP
Information appears at and accessed from only one place at one time	Shared databases, electronic mail, client server architecture	Simultaneously one can access same information at any place and where ever needed
Only an expert can perform complex work	Expert systems, neutral computing	Novice can perform complex work.
Business must be either centralized or decentralized	Telecommunication and networks Client/server	Business can be both centralized and decentralized
Management makes all decisions	Decision support systems enterprise expert systems support systems.	Decision is part of everyone's job.
Field personnel need offices to receive , send, store, and process information	Wireless communication and portable computers, information highways, electronic mail.	Field personnel can manage information from any location
Personal contacts is the best contact with potential buyers	Interactive video disk desktop teleconferencing, electronic mail.	The best contact is the one that is most cost effective.
One has to locate items manually	Tracking technology , groupware, work flow software, client/server	Items are located automatically
Overall plans get revised periodically	High performance computing systems	Plans get revised instantaneously whenever needed
Customized products and services are expensive and take a long time to develop	CAD-CAM,CASE tools on-line systems for JIT decision making , expert systems	Customized products can be made fast and in expensively
A long period of time is spanned between the	CAD-CAM, electronic data interchange , groupware,	Time to market can be reduced 90 percent.

inception of an idea and its implementation	imaging	
Information based organizations and process	Artificial intelligence expert systems	Knowledge based organizations and processes
Move labour to countries where labour is in expensive	Robots, imaging, technologies object oriented programming, expert systems, geographical information systems.	Work can be done in countries with high wages and salaries.

#### 14.4. FLOW OF INFORMATION:

- Information mapping is the key indicator by which an enterprise can be modelled.
- It requires careful analysis of what, when and how .in terms of information that every entity needs.
- If this is done properly, half of the battle related to enterprise modelling is won. The capability of ERP/IT and their organisational impact is shown in table:

**Table: IT/ERP Capabilities and their Organisational Impacts:**

Capability	Organisational Impact/Benefit
Transactional	IT/ERP can transform unstructured process into reutilized transactions.
Geographical	IT/ERP can transfer information with rapidity and ease across large distances making processes independence of geography.
Automational	IT/ERP can replace or reduce human labour in a process
Analytical	IT/ERP can bring complex analytical methods to bear on a process
Information	IT/ERP can bring vast amount of detailed information into a process
Sequential	IT/ERP can enable changes in the sequences of tasks in a process, often allowing multiple task to be worked on simultaneously
Knowledge Management	IT/ERP allows capture and dissemination of knowledge and expertise to improve the process
Tracking	IT/ERP allows detailed tracking of task, status, inputs and outputs
Disintermediary	IT/ERP can be used to connect to parties with in a process that would otherwise communicate through an intermediary

#### 14.5. ROLE OF COMMON/SHARED ENTERPRISE DATABASE

- The integrated enterprise system is supported by a central database, which is also called as enterprise databases.
- It works as the heart of the enterprises model. Information is stored, updated, retrieved and managed in this position.
- It draws data from and fid data into various enterprise application that support different functions.



- Single database reduces information time-lag, reduce distortion of information, instant updating, enhanced reliability and stream lined flow of information.

#### **14.6. SELECTION OF ERP**

- Selection of appropriate ERP package involves careful evaluation of existing ERP alternatives and the needs or profile of the enterprise.
- Proof of concept (POC) approach is a comprehensive and real time selection approach for ERP solution.
- In this approach the organisation is provided with the ERP software for few months. Following stages are incorporated in POC approach
  1. Preparation of project and constitution of ERP team
  2. Analysis of key business requirements
  3. Selection of system
  4. Team agreement on product to prototype

#### **14.7. APPLICATION OF POC APPROACH**

- The POC approach is implementation is supported by vendor, who should be willing to extended facilities. Consultants, if hired till, advice regarding efforts needed for the change.
- Help of some body, who has hands-on experience on previous implementation, is very useful.
- The role of the task force is to coordinate and organise the business activities and make an in-depth deliberation on various issues.
- Next aspect would be linking the approach to reality .for this, some pre-planning is needed .to start with, the enterprise should prepare the present scenario in the minute's detail. This is called "AS-IS mapping of enterprise ".Next step is to visualise scenario, which may emerge after the implementation .this is called." TO-be mapping of the enterprise ".
- Now, the POC is applied to map the processes of the enterprises on the software.
- The objective would be how to transform the enterprises from an "AS-IS "situation to "TO-BE" situation. At this level, the help of implementation expert and support of vendor are crucial.

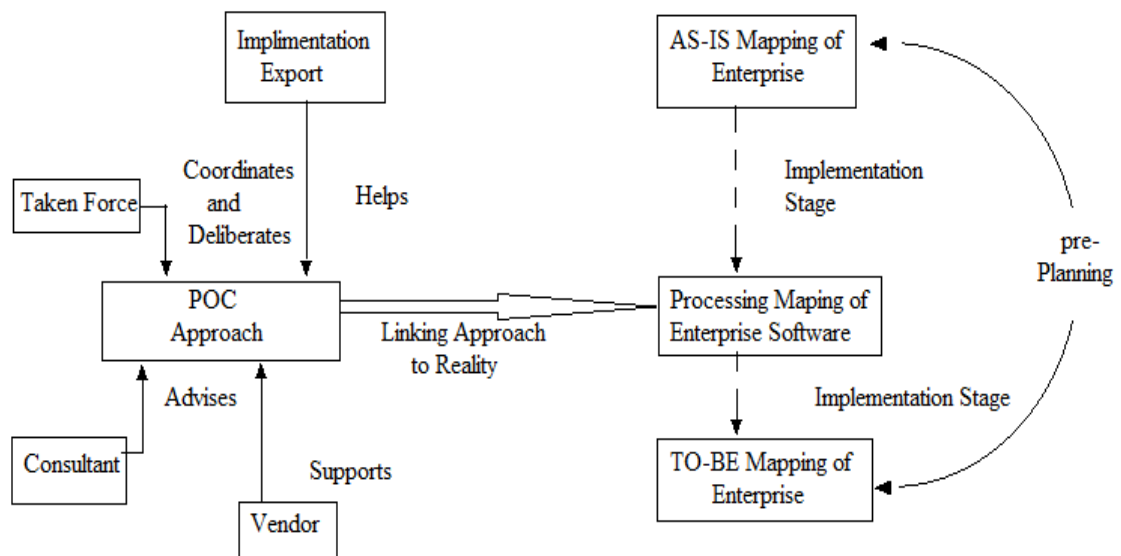


Fig. Use of POC Approach in transforming Business into “TO BE situation”

## 14.8. MATERIAL REQUIREMENTS PLANNING

In the early 1960s, Joseph Orlicky of the J.I. Case company devised a new approach to material management called **material requirement planning (MRP)**. MRP is a proactive material strategy. It is time to order, MRP looks into the future and identifies the materials that we needed, their quantities and the dates on which they will be needed.

### 1. The production scheduling system

- ➔ It uses four data files in preparing the master production schedule.
- ➔ The input data include customer order file, the sales forecast file, the finished goods inventory file, and the production capacity file.
- ➔ The master production schedule projects the production far enough into the future to accommodate the production process that accounts for the longest combinations of suppliers lead time and production time.
- ➔ Production schedules can look more than a year into the future.

### 2. The material requirements planning system:

- ➔ It determines how much material will be needed to produce the desired numbers of units.
- ➔ The bill of material file is used to explode the bill of material for each item scheduled for production by multiplying the quantities on the bill of material times the number of units to be produced.
- ➔ The purpose of the explosion is to determine the total material requirements called gross requirements, that will be needed to produce the scheduled products.
- ➔ The raw materials inventory file is used to determine which of the materials are already on hand.
- ➔ The materials on hand are subtracted from the gross requirement to identify net requirements.

→The items that must be purchased in order to meet the production schedule.

### 3. The capacity requirements planning system:

→The material requirement planning system works in conjunction with the capacity requirements planning system to ensure that the scheduled production will fit within the plant capacity.

→After that determination has been made, the material requirements planning system produces several outputs.

→The main output is the planned order schedule, which lists the needed quantities of each material by the time period.

→Other output includes:

- Changes to planned orders that reflect cancelled orders, expedited orders, and modified order quantities.
- Exception reports that flag items requiring management attention.
- Perform reports that indicate how well the system is performing in terms of stock outs and other measures.
- Planning reports that can be used by manufacturing management for future inventory planning.

### 4.The order release system:

→The order release system uses the planned order schedule for input and prints an order release report.

→One copy is sent to buyers in the purchasing department for use in negotiation with suppliers, and the other copy is sent to shop floor managers for use in controlling the production process.

## 14.9. MANUFACTURING RESOURCE PLANNING (MRP II)

→Oliver Wight and George Plossl, consulting partners are given credit for expanding the MRP concept beyond the manufacturing area so that it could encompass the entire firm.

→The result was called MRP II and the meaning of the letters was changed to manufacturing resource planning.

→An MRP II system integrates all of the processes with manufacturing that deal with materials management. It also interfaces with other subsystems, as shown in below fig.

→It can provide information to the executive information system and to the other functional information systems.

→It also exchanges data with the accounting information sub systems that are involved in materials flow-order entry, billing, account receivable, purchasing, and receiving, accounts payable and general ledger.

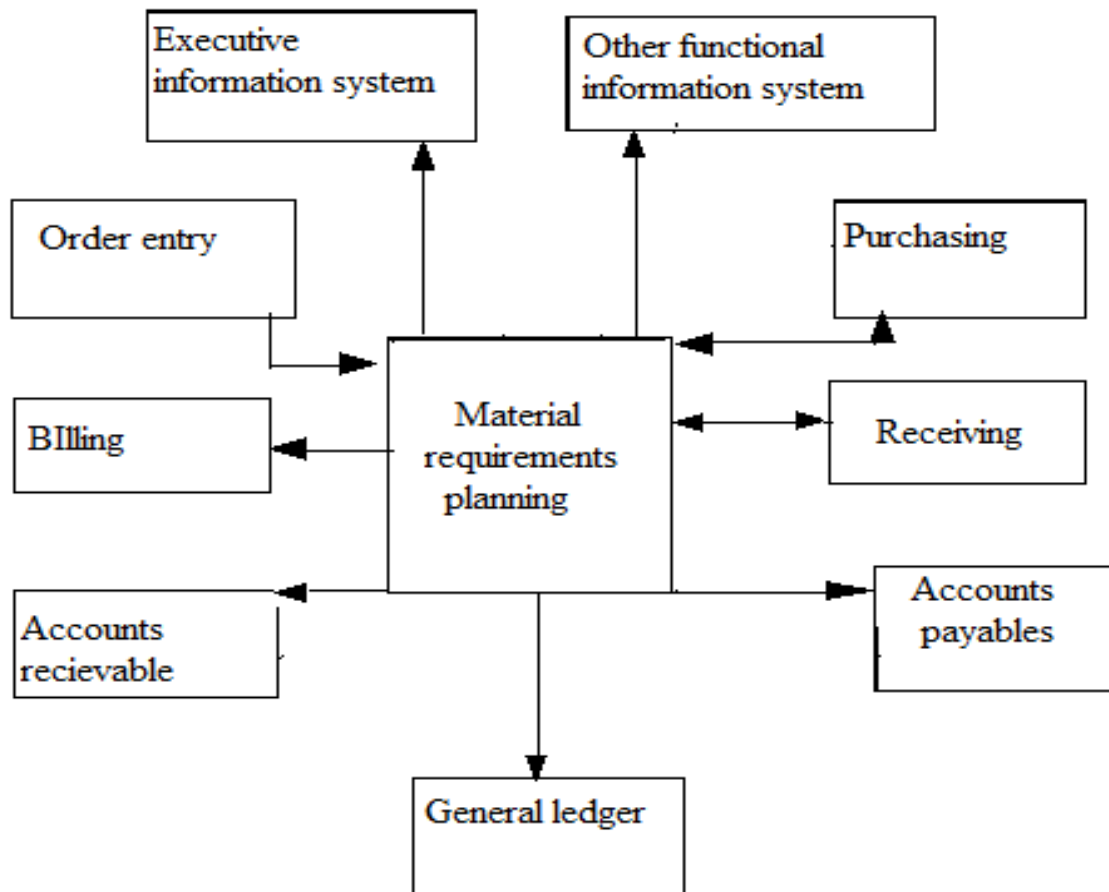


Fig: An MRP II system

**Benefits of MRP II:**

When top management commits to MRP II, the firm can expects benefits in one or more of the following areas:

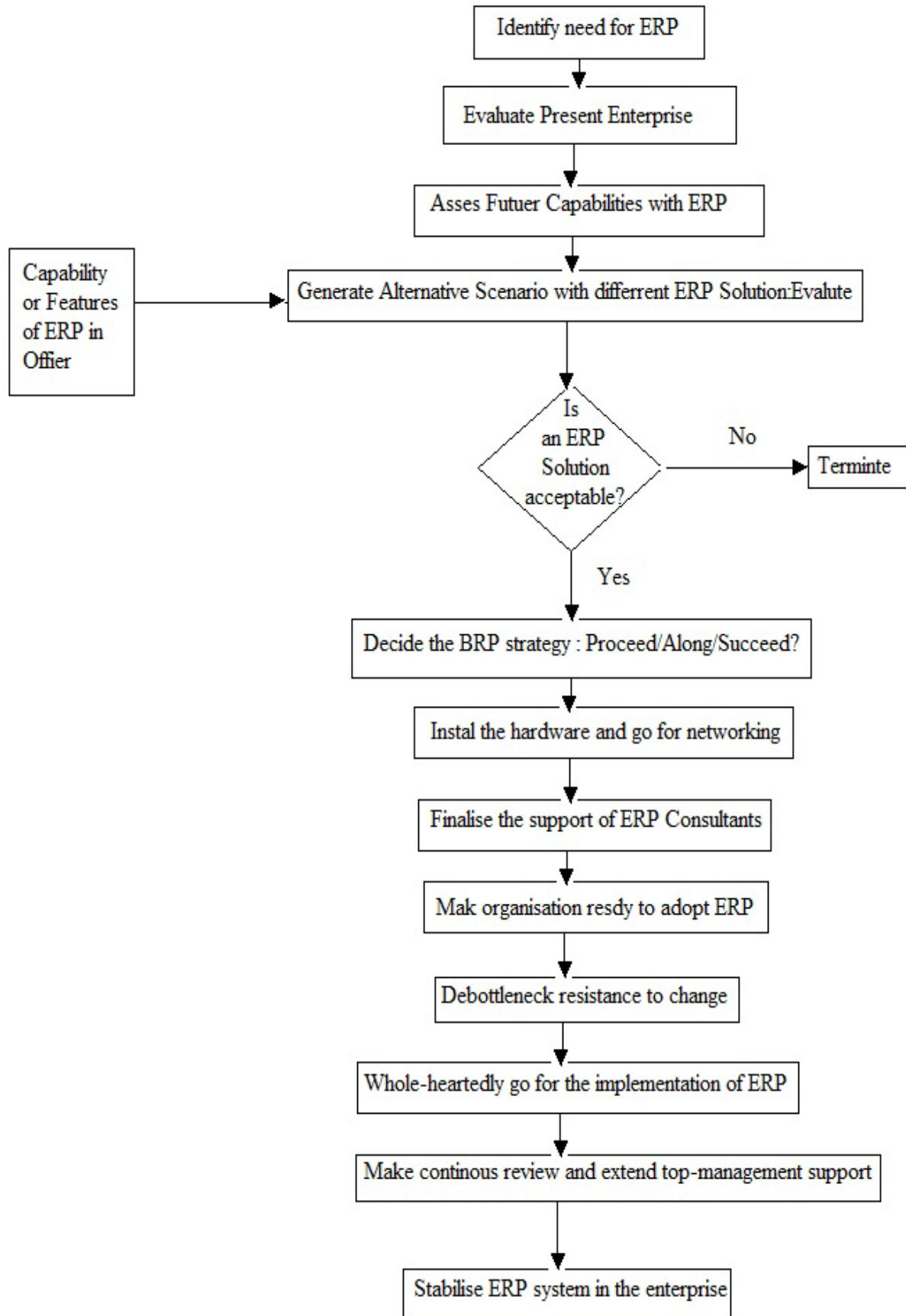
- **More efficient use of resources:** Reductions can be anticipated in both work in process and finished goods inventories, plants equipment can be better utilized, bottle-necks in work centers can be spotted, and equipment maintenance can be better scheduled.
- **Better priority planning:** The amount of time required to get jobs into production can be more easily modified to reflect changing customer needs.
- **Improved customer service:** The ability of the firm to meet promised delivery dates can be enhanced and the opportunity exists for improved quality and reduced prices.
- **Improved employee morale:** Employees can again confidence in the system resulting in improving coordination and communication between departments.
- **Better management information:** Management can use the system output to gain an improved insight into the physical production system and to measure the performance of that system. In addition, the firm's executives and managers from all functional areas can do a better job of long range planning.

### 14.10. BUSINESS PROCESS RE-ENGINEERING (BPR)

- ➔ ERP is a result of modern enterprise how the information system is to be configured to the challenging environment of new business opportunities.
- ➔ Every organization that intends to implement ERP has to Re-engineer its process in one form or the other. This process is known as business process Re-engineering (BPR).
- ➔ Some typical processes of BPR.
  - **Forecasting:** - Shows Sales, Found flows, etc. Over a long period of time, say, next two years.
  - **Fund management:** - Necessity of funds and the way to raise these funds. Uncertainty and risk factors to be considered. Simulation with 'what if' type analysis.
  - **Price Planning:** - Determines the price at which product are offered. Involves application of technology to pricing support such as commercial database services. Also, feedback and sensitivity analysis.
  - **Budget allocation:** - using computerized algorithms to estimate desirable mix of funds allocated to various functions.
  - **Material requirement planning:** - Process of making new products from raw materials and include production scheduling, requirement planning. Also, activities for monitoring and planning of actual production.
  - **Quality control:** - Take care of activities to ensure that the products are of desired quality.

### 14.11. ERP EMPLEMENTATION METHODOLOGY

- ➔ The implementation of ERP is generally done in close association with the vendor, who supplies the package.
- ➔ Many organisations go for hiring professionals/consultants to facilitate the implementation process. Within the organisation, there is a need to form an ERP-team.
- ➔ This team comprises of people with high calibre and motivation. They are from different streams. Process engineer, industrial engineer, HRD personal, financial executive and works manager are sure to find a place in this team.
- ➔ The role of top management is crucial, as the commitment and required flow of finance are major ingredients without which any effort whatsoever is futile.
- ➔ A general methodology for the implementation of ERP is presented in a flow chart.
- ➔ The identification of the need for ERP should be developed through a feasibility report.
- ➔ In this report the present enterprise should also be evaluated alone with much needed future capabilities.
- ➔ Then comes the stages of selection and evaluation of ERP .if the ERP solution is acceptable, then strategy for business process engineering (BPR) is decided.



Methodology for ERP Implimentation

### 14.12. PRINCIPLE FOR ERP IMPLEMENTATION

- The typical failure of ERP implementation has revealed that most of these organizations have started the ERP implementation process by first focusing on automation effort.
- The automation in an enterprise for productivity improvement, without understanding and simplifying the process is one of the major reasons for failure of the ERP implementation
- This leads to the USA principle for implementation of the ERP system.
- USA stands for a sequential approach: Understand-Simplify-Automate.
- The USA approach calls for dedicated effort towards understanding the business process
- Without this any effort for implementation of ERP is likely to fail. Second step is to go for simplification of this process. Final step is to go for the automation of the procedure.

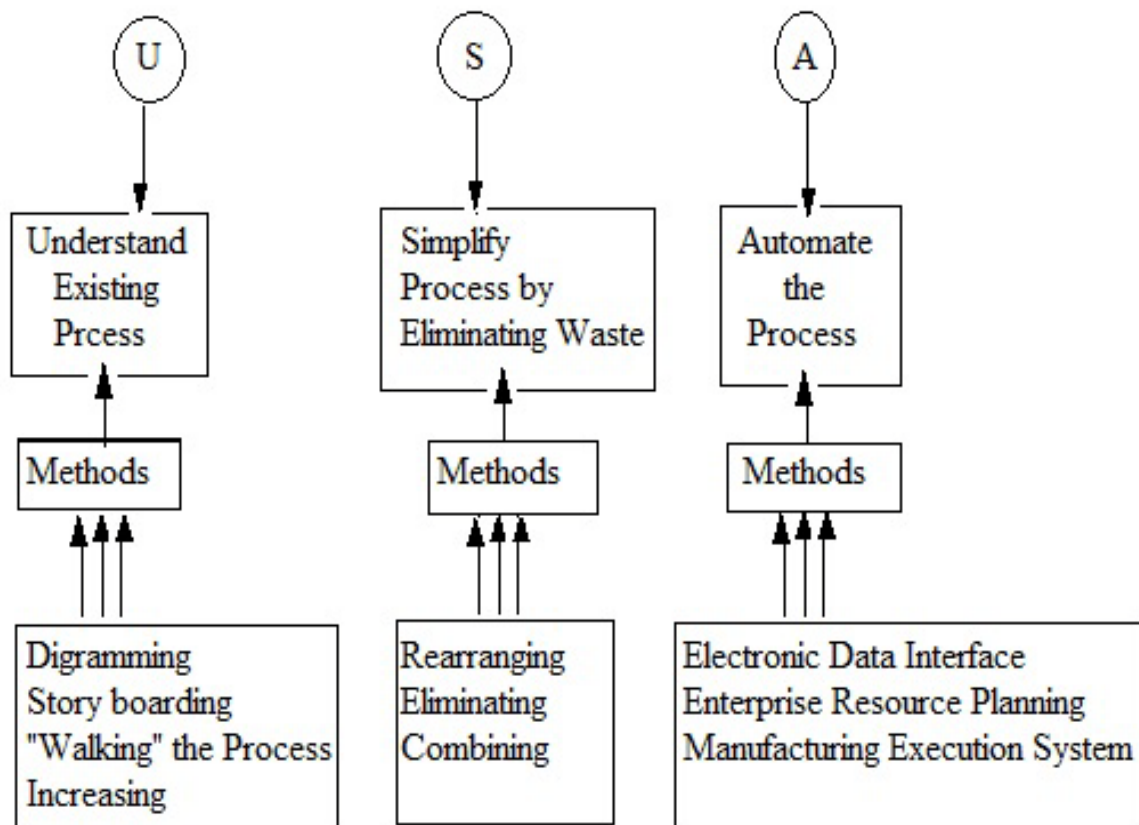


Fig: The USA principle: Implementation flow

### 14.13. GUIDELINES FOR ERP IMPLEMENTATION

- Understand the needs of the enterprise and feeling for corporate culture in the context of readiness for change,
- The message should come from the top regarding adopting of the project.
- Continuous and frequent communication from top regarding usefulness and mindset for the project.
- Initiate with a feasibility report.



- Start with changes in the business processes in the early stages of the project. Make everybody aware of this. Keep them informed: it will reduce resistance for change.
- Decide phase of project implementation. Hold consultative meetings. Try for consensus.
- Top executive should play the role of champion and set the project as the ultimate goal in all efforts.
- Hire experienced consultants.
- Visit sites of your vendors. See how the ERP solution is functioning .Extract useful tips from the existing users.
- Carefully study the documentation of the vendor.
- Hold regular training and appraisal sessions in the organisation.
- Ensure that the problems arising out of changes are handled carefully. Such problems are inevitable.
- Ensure good feedback mechanism to evaluate the results due to implementation.
- Decide whether to go for modular or complete ERP solution.

#### 14.14. CAUSES OF FAILURE IN ERP IMPLEMENTATION

The ERP implementation fails to succeed due to following reasons:

- Absence of an executive sponsor: Since ERP crosses functions within a company, the implementation needs someone with an authority to bring various functional executives together.
- When the project is viewed as IT effort or as an effort is towards automating finance or manufacturing or supply –chain etc.
- When there is no full-time project manager for ERP implementation.
- Lack of documentation of implementation procedure.
- Lack of internal communication by top executive regarding project implications.
- Lack of vendor support and team work.
- Lack of re-engineering effort and insistence on continuation of current practices.
- Massive change and unmanageable transformation without proper grasping by employees.

#### 14.15. SAMPLE LIST OF ERP VENDRS

A sample list of ERP vendors is given:

- **Bann (the Baan company)**, in 1994, a Boeing order catapulted Baan into the global ERP vendor league. Baan has held and built keeping in mind for simultaneously addressing manufactures from the largest global player to smallest ERP user. Baan has a sound technology base and broad functional scope. It offers credible tools for business process analysis linked to implementation of its software, and is launching work flow capabilities. Business planning & control system (BPCS). It remains the market lending manufacturing ERP solution in terms of sites. It offers good functionality for process, discrete and kanban manufacturing, but not for project management.
- **Mapics XA (Marcam Corporation):-** Mapics is a suite of 40 modules with good functionality. Many users report that Mapics offers more functionality than they need. It offers robustness, easy implementation and reasonable value for money.



- **Oracle applications (oracle).** It is internet-enabled, network-centric computing. As a one – stop shop, it offers the data base, tools, implementation, applications and UNIX operating systems running on wide choice of hardware.
- **Prism (Marcam Corporation).** It is a specialist process manufacturing business solution for AS/400. It is the production model, which is akin to a flow chart, handles process industry problems elegantly.
- **R/3 (SAP).** It is the market leader with excellent philosophy of matching business process with its modules. It offers wide range of functions and covers almost all business segments.
- **System21 (JBA).** Its software license revenues area small compared to offer major ERP methods. It offers a rugged, reliable manufacturing solution. It does not offer leading-edge technology.

#### 14.16. ERP SOFTWARE PACKAGE (SAP)

- SAP AG has developed an ERP package called SAP. It is a unique system that supports nearly all areas of business in a global scale. SAP has a number of applications modules in the package. Some of these modules are:-
  - Financial
  - Controlling
  - Investment management
  - Treasury
  - Integrated enterprise management
  - Sales and distribution
  - Production, planning and control
  - Materials management
  - Human resources management
  - Internet and intranet

Each of these modules has no. components, each taking care of specific functionalities of any normal business.

##### ❖ Financials

It covers all aspects of financial accounting and complies with international accounting standards such as GAAP and IAS. It also fulfils the local legal requirements. It mainly covers:

- Financial accounting
- General ledger
- Accounts receivable and payable
- Fixed asset accounting

##### ❖ Controlling cost

It covers the following:

- Overhead cost control
- cost centre accounting
- Overhead orders
- Activity-based costing
- Product cost control
- Cost-object controlling

- Profitability analysis

#### ❖ **Investment management**

Investment management has the following important aspect:

- Corporate wide budgeting
- Appropriation requests
- Investment measures
- Automatic settlement to fixed assets
- Depreciation forecast

#### ❖ **Treasury**

It includes

- Cash management
- Treasury management
- market risk management
- Funds management'

#### ❖ **Integrated Enterprise Management**

It enables accounting data prepared by subsidiaries for corporate reporting which are automatically prepared simultaneously within the local books of each subsidiary. The data is then transferred to a module called enterprise controlling (EC).

#### ❖ **Sales and distribution:-**

The system's sales and distribution application offers access to real-time, on line information from sales support to the billing process. The sales supports component has easy to use the tools manage to information on sales leads, sales calls, inquiries, quotations, marking campaigns, competitors, and their products

#### ❖ **Production Planning and Control**

Production Planning and Control (PPC) module covers the complete production process starting from creation of master data, production planning, MRP, capacity planning production control and costing. PPC covers the following:-

- Sales and operation planning
- Production control
- Quality management
- Project system
- Project information system

#### ❖ **Materials Management:-**

This module contains all functions required to simplify business processes in requirements planning, purchasing, inventory management, warehouse management and invoice verification. It also introduces a high degree of automation into standard procedures. Materials management module has the following features: Inventory management. Warehouse management, Invoice verification, Quality management, Plant maintenance, Service management.

#### ❖ **Human resource management:-**

This module provides comprehensive process-driven solutions that can address organisation's needs for human resources. It covers the following:

- Personnel administration
- Employee master data

- Recruitment management
- Open positions
- Selection and hiring

❖ **Internet and Intranet**

- It offers special internet functionality for large number of business processes. SAP business workflow enables to create work routines. All users automatically receive a list of their tasks in their mail system in box. Once the work is completed, the work flow starts the next predefined work-step and sends relevant messages. A range of work flow techniques, such as optical archiving mailing and office communication, can be used at every stage
- In essence the success of any organisation today depends on its ability to look at business in totality without being influenced by strictly departmental boundaries. ERP which is an integration of components such as business models, operating processes, control processes, and changing strategic business processes, enables the organisation to realize its version and objectives in a systematic and feasible manner.

# CHAPTER-15

## SUPPLY CHAIN MANAGEMENT

### 15.1 INTRODUCTION

- Supply chain management (SCM) is a management concept integrating management of supply chain processes.
- It integrates supplier, distributor, and logistic requirements of the customer into one cohesive process to reduce time, effort and inventory costs. For SCM solution, necessary and clear understanding of ERP is necessary as many ERP vendors provide SCM solutions.

### 15.2 DEFINATION

- Supply chain and supply management reveal the common thing of material, information and financial flows coordinating among suppliers, manufactures distributors customers of product and services.
- The supply chain may be defined as” a network of autonomous and semi autonomous business entices involved through upstream and downstream linkage in different processes and activities that produce value in the form of physical products and services in the hands of ultimate customers.”
- Supply chain consists of the network of organization that connects suppliers and end users. It provide the route through which raw materials is converted into finished products and reaches into the hands of customers.
- Supply chain management, in turn, covers the "flow of goods from suppliers through manufacturing and distribution chains to the end users".
- In the context of an ERP solution, SCM is defined as "a part of ERP software solution, internal business practices, and tightly managed trading partner relationships that allow an enterprise to provide more efficient services to the customers by better organising and coordinating internal and partner activities".

### 15.3. CONCEPT OF SCM

- The concept of supply chain management provides a framework for integration of information, material and finance of an enterprise, right from the suppliers to the customers.

### 15.4. SCM PROCESS

- Supply chain management encompasses management of all elements and activities of the supply chain.
- This includes material suppliers, production facility, distribution services and costumers ;linked together via the feed forward flow of information and the feedback flow of materials .Supply chain term is common in industries having global costumers/supplies base, e.g. textile ,electronics, automobile ,pharmaceutical ,etc.
- The inclusion of distribution as a key link of supply chain makes its scope wide and extended.

- Distribution may incorporate many stage such as ware house C and F(carry and forward) agents of third party freight forwarders, wholesalers retailers and servicing units. The involvement of this link of the supply chain with the end user (customer) makes it extremely vital in the contest of present day focus on costumer satisfactions.

## 15.5. STEVAN'S MODEL OF SUPPLY CHAIN INTEGRATION

- Stevens (1989) and Stevens, et. /al.(1995) had provided a simple model to understand supply chain integration. It involves transforming of an enterprise from an inward looking to a flexible out word looking in an efficient manner.
- The transformation can be performed incorporating the technological, organisational and attitudinal attributes. Integration of the supply chain is a four stage process involving the following.
  - **Base line:** understanding of material flow from purchasing to distribution.
  - **Functional integration:** understanding the functionality of material management, manufacturing management, and distribution.
  - **Internal integration:** internal integration of material management, manufacturing management and distribution.
  - **External integration:** integration of suppliers, internal supply chain and costumers.

There are two common approaches for evolving a SCM environment:

### INTERNAL INTEGRATION

- Integrated system, e.g., ERP solutions such as SAP R/3.
- Link-functions such as purchasing, manufacturing, inventory finance, marketing, etc.
- Shared data and integrated processes.

### INTRA-FIRM INTEGRATION

- Inter organisational information system such as extranet.
- Link firm's system with external entities –suppliers, distributors, retailers, etc.
- Shared data and integrated processes.

## 15.6. GOAL/COMPONENTS OF SCM

The goal of SCM is to cut costs, increase profit, improve performance in relationships with customer and suppliers, and develop values-added services that give a firm a competitive edge. SCM has mainly three business objectives:

1. Get the right Product to the right place at the least cost.
2. Keep inventory as low as possible and still offer superior customer service.
3. Reduce cycle times. SCM seeks to simplify and accelerate operations that deal with how customer orders are processed through the system and ultimately filled, as well as how raw material are acquired and delivered for manufacturing processes.

Components of SCM are explained below:

- **Supplier management.** Use electronic commerce to help reduce the number of suppliers and get them to become partners in business in a win/win relationship.
- **Inventory management.** Shorten the order-ship-bill cycle with electronic commerce process, and keep inventory levels to a minimum.

- **Distribution management.** Use electronic data interchange to move documents related to shipping (bills of lading, purchase order, advanced ship notices, and so on).
- **Channel management.** Use E-mail, Bulletin board system, and newsgroups to quickly disseminate information's about changing operational conditions to trading partners.
- **Payment management.** Use electronic funds transfer to link the company and systems suppliers and distributors so that payment can be sent and received electronically.
- **Financial management.** Use electronic commerce system to enable global companies to manage there money in various Foreign exchange accounts.
- **Sales force management.** Use of sales force automations methods to improves the communication and flow of information among the sales, customers service, and production functions.

SCM relies on information's technology and management practices to optimise information and product flows among the processes and business partners within the supply chain. All the constituents of supply chain have there own short-term and long-term objectives. There operating decision are based on these objectives. It is very common that decision of the constituents may not be aligned to the overall strategic goal of the entire supply chain.

## 15.7. PERFORMANCE OF SUPPLY CHAIN

Performance Measure Type	Goal	Purpose	Example List
1. Resource	High level of efficiency	Efficient resource management is critical to profitability	<ul style="list-style-type: none"> <li>• Total cost</li> <li>• Distribution cost</li> <li>• Manufacturing cost</li> <li>• Inventory cost</li> <li>• Return on investment(ROI)</li> </ul>
2. Output	High level of customer service	Without acceptable output, customer will turn to other supply-chains.	<ul style="list-style-type: none"> <li>• Numbers of items produced</li> <li>• Time required to produce a particular item or set of items</li> <li>• No. of on-time deliveries</li> <li>• Customers satisfaction</li> <li>• Product quality</li> <li>• Total revenue (Sales)</li> <li>• Profit (Total revenue less expenses)</li> <li>• Fill rate (Proportions of order filled immediately)</li> <li>• On-time deliveries</li> <li>• Back order (stock out)</li> <li>• Customer response time</li> <li>• Manufacturing read time (</li> </ul>

			total time required to produce a particular item or batch) <ul style="list-style-type: none"> <li>• Shipment error</li> <li>• Customers complaints</li> </ul>
3. Flexibility	Ability to respond to a changing environment	In an uncertain environment, supply-chain must be able to respond to change.	<ul style="list-style-type: none"> <li>• Volume flexibility(ability to change the output level of products)</li> <li>• Delivery flexibility (ability to change planned delivery dates,)</li> <li>• Mix flexibility (Ability to change the variety of products produced)</li> <li>• New product flexibility (ability to introduce and produce new products and ability to introduce modification in existing products)</li> </ul>

## 15.8. COMPARISON BETWEEN ERP AND SCM

ERP	SCM
<ul style="list-style-type: none"> <li>• Primary function of ERP is to generate data.</li> <li>• ERP is the body of the enterprise</li> <li>• ERP systems are linear and interactive</li> <li>• EPR generates data</li> <li>• ERP excels in the transaction management</li> <li>• ERP links processes only within the organisation</li> </ul>	<ul style="list-style-type: none"> <li>• SCM provides capability to the date enterprise so that it can make sense out of data to help to make decisions.</li> <li>• SCM is the brain of the enterprise</li> <li>• SCM is constraint-based and optimised.</li> <li>• Data generated in ERP are used in the best possible way by optimising the system in a SCM</li> <li>• SCM affords forecasting and the decision-support.</li> <li>• SCM goes beyond the conventional boundaries of the organisation and spans in the entire supply chain.</li> </ul>

## 15.9. ERP IMPLEMENTATION: A CASE OF DISTORTION OF DEMAND

- Distortion of demand' along the supply chain is a common problem .while explaining the law of industrial dynamics ,Burbidge (1984) postulated that the variation in demand for product

increase as it passes through a series of transfers in supply-chain ,and stock-control ordering is used.

- Uncertainty in economy, market being in-and –out recession, tendency of management to over react to periodic economic swings, which are very common, and creating a safety-net in material planning are few reasons for “amplification of demand” in a supply chain .The effect of amplified demand –distortion is evident in a factory, which is a down stream link of the chain. This may be due to time –delays, planning, distortions and inventory movements in the preceding links of the chain.
- Internally this behaviour is seriously present all throughputs the chain. The classic case is the ‘marketing –manufacturing conflict “the demand for cast is initial by marketing so as to obtain longer allocation from the manufacturing units. This saves them from being caught in short-supply situation under an upward market swing. Manufacturing and distribution are also smart people. They make a second guess apparently to nullify, which cerates further distortion in demand. Similarly, other elements of the chain contribute to the inventory building measure. Decision regarding required-capacity of the enterprise lag behind the changes in demand .This cau8ses further building-up a safety net for inventories or lost sales due to under production.

## 15.10. SUPPLY CHAIN SOLUTION VS ERP VENDORS

<i>ERP – Vendors</i>	<i>Supply Chain Solutions/Functions</i>
SAP India	Advanced planner and optimiser and SCOPE
BaaN India	BaaN supply chains solutions
12 Technologies	Rhythm
Mastek	Goalmine (for selling software)
Oracle India	Oracle applications for supply chain management
QAD	On/q
People soft	For transaction(ERP)
J.D Edwards	For transactions(ERP)
IBM Global services	Not branded
Siemens InfoTech	Not branded
Through put	Not penetrated Indian market
Geopolitics LEP	Yet to come to India
Red pepper	For resource planning, strategy
Manugistics	For operational, tactical response
Paragon	---
Numetrix	Transactions support, ATP,CTP

## 15.11. BENEFITS OF SCM

- Integrated view of enterprise resources & constraints.



- Improved channel efficiency by sharing information between suppliers and costumers.
- Reduced inventory levels and production cost.
- Extension of organizational control beyond farm boundaries.
- ROI (return of investment): typically 10 times the cost of developing and implementing the system.

#### **15.12. DISADVANTAGES OF SCM**

- Poor implementation of due to enlargement of scope
- Information access and security
- Supply- chain interruptions.
- Unidirectional loss of bargaining power
- Training and change management
- System maintenance
- Challenge of developing trust and managing inter organizational dependencies.

# CHAPTER-16

## APPLICATIONS OF INFORMATION TECHNOLOGY IN BUSINESS

### 16.1 INTRODUCTION

- A new revolution is in the making, similar to the industrial Revolution that took place at the turn of the last century. Many economists, management expert and futurists agree that the world has entered the new age of information.
- Alvin Toffler's third wave or Peter Drucker's post-industrial society – the new era is being increasingly referred to as the information age.
- The primary driver of this information age – technology and markets – is well known. Marketing, enterprise, entrepreneurship are some of the other drivers. According to Professor Tom Cannon, the new industrial revolution surrounding us required profound change; profound change in the way enterprise is being considered, develop business, the way we manage and the structures within which we manage. He foresees not just a change in the market but a fundamental change in the economic relationship between people, between economies, and between societies. Information and information technology (IT) are the new drivers of this age.

### 16.2. E-COMMERCE (EC)

The internet and the web have revolutionised commerce and created new paradigms. The new business paradigm is based on the virtual corporation paradigm which has come into being through combination of intranets and extranets. The following three types of EC, supported by networks, have emerged:

- Consumer to business
- Business to business
- Intranet procurement

**Consumer to business EC:** - Electronic malls, virtual storefronts allow individual consumers to browse for products and shop using credit cards. This form of EC is internet based, with unrestricted access to consumer's. Credit-card payments have to be secured against unauthorised access by intruders on public network.

**Business to business EC:** - In this case, bulk of commerce, as much as 70%, is conducted over networks. Business to business procurement and fulfilment including financial transactions has traditionally been conducted over private networks. This segment of EC is driving extranets. It is restricted to business partners and users secure procedures based on firewall, encryption authorisation level, with payment by predetermined credit terms.

**Intranet procurement:** - Business transactions, which are internal to an organisation, across its departments and subsidiaries also comes under EC. Internet sales, order processing, intracompany charging and billing, fund transfer for accounting purposes are some of the an organisation. This can span the entire globe in case of multinationals. Intranets are responding to this challenge.

## 16.3. COMMERCE OVER THE INTERNET

Commerce over the internet conducted essentially in two ways: EDI over the internet and Web-based EDI.

### 16.3.1. EDI over the internet

- Internet mail is used as a means for transmitting EDI messages. The IETF-MIME specification is used to envelope the EDI data within the E-mail message. With this arrangement internet replace the proprietary VANs for exchanging of EDI message between trading partner. While the cost of transmitting of EDI message gets substantially reduced this way, there are other problems related to security and integrity of transactions, as also relatively of the internet which becomes dominate issues. These issues are being addressed, and cost effective solution have been created by a number of organizations.
- EDI over the internet for more flexible, since there is no need for prior network connection. This way more and more firms, including smaller firms, exchange EDI messages. EDI network are typically set as a hub with spokes; a big buyer at the hub dictating its suppliers at the spokes, which cannot communicate among themselves. Since the internet replaces much of this limit network its own likes, which are everywhere, virtual trading communities' gate formed over it.
- Individually trading partners (TP) register there business as domain names on the internet. When if they change network service providers, they own domain name. Filtering software, based on rules, processes the EDI messages, and issues auto response for information about setting of a TP relationship. Mechanisms are in position that allows delivery of the EDI messages directly to redundant EDI-process with out the usual store and forwarding, which greatly simplify EDI-over the internet. The filtering programs analyse values in MIME headers, and forward messages to appropriate application based. It is through this approach that the EDI messages get directed to EDI translator programs, which retrieve the business, interchange for future processing the recipients' computer system.

### 16.3.2. Web based commerce

- Web based commerce on the internet has taken the world storm. It is a new way of conducting. The web, with its capability to play audio, display graphics, pictures and video, enables internet users to request information and order products instantly. This is possible in interactive mode making it an excellent choice for companies and Organisations to display their wares: products and services. It is this capability, coupled with the world wide reach of the web that has led to a phenomenal growth of commercial sites with Internet registrations (.com address). The growth of Web Sites continues exponentially.
- The commercial web sites of companies have web documents that offer useful product information, interactive brochures, news, reviews, etc. The companies can create electronic brochures in colour with graphics, audio and video and can reach customers worldwide for very little cost, instead of printing brochures and mailing them which is much more expensive. The electronic malls and stores on the web enable one to see and order

merchandise by using a forms interface, an *electronic form* that contains blank boxes for the user to enter information on product codes, credit card number, etc.

### 16.3.3. Security issues in electronic transactions

The main issues that confront in relation to securing electronic transactions are:

1. Confidentiality
  2. Integrity
  3. Availability
  4. Authenticity/ non- reputability
  5. Auditability
- **Confidentiality:** - Information should be protected from prying eyes of unauthorised internal users, external hackers and from being intercepted during transmission on communication networks by making unintelligible to the attacker. The content should be transmission in such a way that it is not decipherable by anyone who does not know the transformation algorithm.
  - **Integrity:** - On retrieval or receipt at the other end of a communication network the information should appear exactly as was stored or sent. It should be possible to generate an alert on any modification, addition or deletion to the original content. Integrity also precludes information 're-play' i.e., a fresh copy of the data is generated/ re-sends using the authorisation features of the earlier authentic message. Suitable mechanisms are required to ensure end to – end message content and copy authentication.
  - **Availability:** - The information that is being stored or transmitted across communication network should be available whenever required and to whatever extent as desired within pre-established time constraints. Network errors, power outages, operational errors, applications software errors, hardware problems and viruses are some of the causes of unavailability of information. The mechanisms of implementation of counter – measures to these threats are available but beyond the scope of end- to –end message security for implementing electronic commerce.
  - **Authenticity:** - It should be possible to prevent any person or object from masquerading as some other person or object. When a message is received it should be therefore be possible to verify whether it has indeed been sent by person or object claiming to be the originator. Similarly, it should also be possible to ensure that the message is sent to the person or object for whom it is meant. This implies the need for reliable identification of the originator and recipient of data.
  - **Non-reputability:-** After sending / authorising a message, the sender should not be able to, at a later date, deny having done so. Similarly, the recipient of a message should not be able to deny receipt at a later date. It should, therefore be possible to bind message and message acknowledgements their originators.
  - **Auditability:-** Audit data must be recorded in such a way that all specified confidentiality and integrity requirements are met.

## 16.4. ELECTRONIC CASH OVER THE INTERNET

- Electronic or digital cash (e-cash) is a new concept to execute cash payments using computers connected over networks. To make it a reality with security and privacy of transaction, a number of solution providers have come into being.
- Using software on the customer's own computer, the concept can withdraw e-cash from his/her own account in a bank. The e-cash is stored in the hard disk of the customer's computer in an electronic wallet which can be spent by the customer for purchase of items from any shop accepting e-cash.
- Digital cash can be used for making/receiving payments between customer and merchant or persons or for money transaction.
- The customer can use a browser to see products offered for sale on the web. He scans the sale pages and identifies ten products available in different shops along with their sale prices. In doing so, the customer browses through the web pages on the merchant/shop owner's servers.
- After identifying the products the customer wants to buy he sends a request to the customer's bank server for spending electronic cash from his account to his own system. The message is in enciphered form. The Bank server (after checking authenticity, balance, etc) sends back a secure e-cash packet which is stored in the electronic wallet of the customer's hard disk.
- Having obtained e-cash from his own computer, the customer sends an order to the merchant/shop owner's server along with billing and shopping address, quantity ordered and the exact e-cash required for the purchase.
- The merchant (after receiving the order along with e-cash) issues a receipt electronically to the customer and send the e-cash to his account in the merchant bank. The merchant takes the desired step for delivery of items to the customer. The merchant then send the e-cash packet to the customer's bank. The customer's bank after using the customer's public key and the security packet received verifies the remits the actual fund to the merchant's bank who transfer this money to the account. The customer gets the item despatched by the merchant at the shipping address.
- As the e-cash can reach the destination site using computer network or internet which has an open architecture, the security of the system is very important. Security is provided using encryption, digital signature and passwords. As e-cash is digitally signed by the customer, there is no room for dispute over payment. The implementations vary from one to another solution provider.

### 16.4.1. Elements in electronic Cash Flow

- **Client software**

Software available from various solution providers works latest versions of windows 98, windows 3.1, Macintosh and UNIX. Some of them make use of web browsers and e-mail reader and some require dedicated software for browsing encrypted information. In most of these cases, the software at the customer site is provided free. Almost all solutions require a TCP/IP network connection.

- **Merchant server software**

Some solution providers design custom application software for the merchant, others integrate functions with web servers. In another solution, the server must have the Netscape commerce server whereas some provide a software library for free.

- **Payment by the customer**

The customer can make payment using a credit-card number, by e- cash from a participating bank, or through an automated clearing house (ACH). The option depends again on the solution being provided by the service provider.

- **Payment to merchant**

In debit-based transactions , the merchants gets payment immediately , from the customer's bank in his account, through ACH, through a bank transfer, or, within a day of the cleaning period, In credit transactions, the merchant gets paid through a bank transfer of through a normal credit-card processing cycle.

- **Transaction cost**

The cost per transaction varies for credit and debit transaction and with the service provide. In some cases, there is a fixed amount per transaction, whereas others charge a percentage of the amount of transaction.

- **Risk**

In most of the solutions provided, the risk is the merchant's for fraudulent transactions. In case of disputed debit transactions or if after payment a merchant is unable to deliver, the customers lose.

- **Applications**

Electronic case applications include debit cards, vending telebanking, teleshopping, phone cards, parking systems, public transit systems and automatic toll collection, etc.

## 16.5. INTERNET SECURITY

- Establishing rules to decide which packets, depending on the originating IP address, should be allowed to pass into the organisation network.
- Establishment of proxy servers, so that internal client requests for accessing external service are routed through the proxy server. This ensures that the client and the external server are not in direct communication with each other.
- Establishment of an additional network as a buffer between the internal and external networks.

### 16.5.1. Guidelines for Cryptography policy

- The cryptography method should be trustworthy in order to generate confidence in their use.
- Users should be free to choose any cryptography method based on their security requirements.
- Cryptography methods should be developed in response to the needs of businesses, individuals and governments.
- Technical standards and protocols for cryptography should be developed and promulgated at the national level.
- Fundamental rights of individuals to privacy should be protected.

- National policies may allow lawful access to plaintext, cryptographic keys and encrypted data.
- Liabilities of individuals and entities that offer cryptographic service should be clearly stated.
- Governments should cooperate in coordination of cryptographic policies.

## **16.6. ELECTRONIC BUSINEES (E-BUSINEES)**

E-business is about using internet technologies to transform the way key business processes are performed. Its visible from is online purchasing, both wholesale and retail. Every day, more companies and people gain access to the Web, and every day, more purchases are transacted electronically.

### **16.6.1. Opportunities**

There is a range of E-business opportunities that depend on the nature of the business and the customers services. Here are some opportunities of online business:

- Retail sellers on the internet can sell high- quality, specialized product that appeal to an audience of affluent, well-educated, and well- informed people.
- Companies that sell their good through catalogs and expand their reach to additional global customers at a low marginal cost.
- Business – to –business sellers, the majority of whose customer base is already on the internet, can build a closer relationship, electronically.
- Companies that already have a corporate web site and an efficient network operation can establish subsidiary sites for related, ancillary, or consumable products.
- Business selling products that can be sampled on the web (for example, books, magazines, and recorded music) can promote them economically.

### **16.6.2. Benefits**

The primary benefits of e-business are global accessibility and sales reach, the prospect of increased profits from new markets and electronic channels, improved customer service and loyalty, shorter time-to-market and supply chain integration.

- Global accessibility and sales reach
- Market base expansion
- Increased profits
- Improved customer service and loyalty
- Shorter time to market
- Supply chain integration

### **16.6.3. E-business strategy**

Following are the e-business strategies:

- The impact of extending the enterprise

- Updating operational habits and reducing costs
- Pressuring resellers
- Transferring power to buyers
- Personalization
- Trust and privacy
- Requirements for e-business platforms
- Quick start-up
- Scalability and variety of upgrade paths
- Staff familiarity
- Availability of end-to-end service
- Flexible purchasing process
- Strong search and product selection capabilities
- Open architecture

### **16.7. APPLICATIONS OF E-COMMERCE IN INDIA**

- Customs
- Reserve bank of India
- Airport authority of India(AAI)
- Apparel export promotion council(AEPC)
- Banks
- Directorate general of foreign trade
- Port authorities
- Ford India ltd-A Giant in Automobile company
- Building and construction materials industry
- Metal industries
  - Office Automation industry
  - Packaging industry
  - Indian engineering industry
  - The logistics industry

### **16.8. SUCCESSFUL E-COMMERCE**

In order to remain successful in today internet-driven marketplace, established enter-prises have to be able to function e-business. E-business is extended organisations, with lean, core business models, supplemented by outsourcing arrangements and business alliances. They are tightly integrated with customers, supplies, partners, and remote employees via intranets, extranets and the public internet.

### **16.9. MOBILE COMMERCE**

Mobile commerce, commonly referred to as M – commerce, means to pay for merchandise services or information through a mobile phone. Wireless application protocol (WAP) is enabling technology to bring the internet content and services to mobile phones and other wireless terminals.



Some of the important aspects of M-commerce are: -

**WAP:** - WAP provide a much – needed medium to connect in a secure, fast, nimble, online, interactive way with services, information and other users.

**WAP application:-** Wireless application have a major role to play in easing business processes in every situation where information exchange is a critical need. WAP is being used to develop enhanced forms of existing application and view versions of today's emerging application.

## 16.10. E-GOVERNANCE

E-government is defined as a mere delivery of government services and information to the public using electronic means, e-governance allows citizens to communicate with government , participate in the government's policy-making and citizens to communicate each other. It truly allows citizens to participate in the government decision-making process.

- Government to government
- Government to citizen
- Citizen to Government
- Government to private and other sectors
- Private and NGOs to Government

### 16.10.1. Models of E-governance

There are four model of e-governance

- **Broadcasting / wider dissemination model**
  - ❖ Placing government laws and legalisation online.
  - ❖ To make available online the name, address, fax numbers, e-mail, etc.
  - ❖ To make available online information relating to government plans, budgets, expenditure, and performances.
- **Critical value information-flow model**
  - ❖ To make available online research, enquiry reports, reports of the various commissions.
  - ❖ To make available critical environmental information to local inhabitants.
- **Comparative analysis model**
  - ❖ To learn from historic policies and actions and derive learning lessons for future policy-making.
  - ❖ To evaluate effectiveness of current policies and identify key learning in terms of strengths, flaws in policies.
- **Interactive service model**
  - ❖ Establish decentralised form of governance.
  - ❖ Performing governance functions online such as revenue collection, governmental procurement, payment transfer etc.

## REVIEW QUESTIONS

### A. SHORT QUESTIONS(2 Marks)

1. Define MIS.
2. What is management?
3. What is information?
4. What is system?
5. Define system approach.
6. How many types of decisions used in MIS.
7. Write types of information system.
8. Write the phases of system life cycle.
9. Write categories of management triangle.
10. Write framework for MIS organization.
11. Write the reasons for system approach.
12. Differentiate between data and information.
13. Mention the disadvantages of information system.
14. Write down the objectives of MIS.
15. What is a transaction processing systems.
16. Write down the characteristics of transaction processing system.
17. What is intelligent support system?
18. What do you mean by facsimile transmission?
19. Name 3 input devices used in personal computer
20. .How many types of digital computer are there.
21. Name 3 output devices used in personal computer.
22. What are the differences between volatile and non volatile memory? Give an example of each.
23. Differentiate between RAM and ROM.
24. Differentiate between primary storage and secondary storage.
25. What are the three main components of the CPU?
26. What are the size of memory of byte, kilobyte & megabyte?
27. What are procedural and non procedural languages?
28. Differentiate between an assembler and a compiler
29. Define system software.
30. Differentiate between compiler and interpreter.
31. Which type of software plays only an indirect role in problem solving?
32. What do you mean by data communications?
33. Differentiate between bounded media unbounded media.
34. What is a host commuter?
35. Differentiate between synchronous and asynchronous transmission.
36. Define simplex, half duplex and full duplex mode.
37. Define modem.

38. Define database.
39. Define DBMS.
40. Differentiate between database and traditional files.
41. Differentiate between files and traditional databases.
42. Name at least two functions of DBMS.
43. Define schema and subschema.
44. What is an entity relationship diagram?
45. What are the disadvantages of client server system?
46. List out some advantages of client server systems.
47. What is a client server system?
48. What are the different components of client server systems?
49. What do you mean by server and client?
50. Write down front-end software and back- end software.
51. Define a decision support system.
52. Write down the objectives of DSS.
53. Write the relation between DSS and MIS with the help of suitable diagram.
54. Write the characteristics of expert system.
55. Write any 2 applications of DSS.
56. Outline the success criteria for DSS.
57. What are the three types of computer based support available in a GDSS
58. Write down the characteristics of DSS.
59. Define office automation.
60. What is office information system?
61. Define structure query language (SQL).
62. Define switch.
63. What are the three main components of network planning?
64. Identify the principle of data base management.
65. What is distributed database?
66. What is network model?
67. What do you mean by World Wide Web?
68. What is E-commerce?
69. Define electronic data interchange.
70. What is E-MAIL?
71. What is computer integrated manufacturing?
72. Define human resource information systems (HRIS).
73. What do you mean by a marketing information system?
74. What is groupware?
75. What is teleconferencing?
76. Write down the advantages of marketing information systems.
77. Write down the disadvantages of prototyping.
78. Write down the advantages of prototyping.
79. What is prototyping?
80. What is end user computing?
81. What is rapid application development?

82. What do you mean by computer based information system?
83. What is system approach?
84. What is network model?
85. What is agile manufacturing?
86. What are the 4 main characteristics of agile manufacturing?
87. What the advantages are of cross functional system.
88. Define is SMIS.
89. Write different types of strategic systems
90. Define information resources management.
91. Write down the principles of information resource management.
92. What are the objectives of information resource management?
93. Define ERP.
94. Define Supply chain management.
95. What are the benefits of Supply chain management?
96. What is the disadvantages supply chain management?
97. Comparison between ERP and SCM.
98. What is E-Business?
99. Define mobile commerce.
100. Define E-Governance.
101. What do you mean by digital case?
102. Write down the applications of E-business?

#### **B. LONG QUESTIONS(6 marks)**

1. Explain the approaches of MIS development of an organization.
2. Explain the functions of management.
3. Write disadvantages of information systems.
4. Write Meaning and objectives of MIS?
5. Explain the characteristics of TPS, MIS, ISS, and OAS in terms of input, processing, output, users and applications.
6. Explain framework for MIS organisation and management triangle.
7. Describe computer-based information systems.
8. Name and describe two input and output devices.
9. Explain the classification of computer?
10. Differentiate between primary storage and secondary storage.
11. What is the basic difference between an assembler and a compiler, and also between a compiler and interpreter?
12. Explain various types of software being used in data communications?
13. Explain various types of hardware being used in data communications?
14. What is the difference between bounded media and unbounded media? Explain the types of bounded media and unbounded media.
15. What do you mean by topology? describe different types of topology.
16. Outline the basic operating principles of ISDN. Briefly explain each of them.
17. Explain data hierarchy with an example?
18. Write advantages and disadvantages of DBMS.
19. Explain limitations of file-based systems.

20. Explain the components of a DBMS.
21. Explain object-oriented database structure.
22. Write principles of database management.
23. What are the advantages and disadvantages of client server computing?
24. Explain the components and functions of a client-server system.
25. Write the steps are required for development of client-server system.
26. Explain the component of a DSS?
27. What are the differences among TPS, MIS, DSS, and EIS?
28. Describe the applications of a DSS.
29. Briefly describe the functional areas of business with suitable diagram.
30. Write advantages of manufacturing information systems.
31. Write limitations of SDLC.
32. What is prototype? Describe different types of prototypes
33. Write advantages and disadvantages of Prototyping.
34. What are the essential ingredients of RAD?
35. Explain different types of financial and accounting information systems.
36. What do you mean by data base management system? Explain data management?
37. Explain the characteristics of SMIS.
38. What is GDSS? Explain the types of computer based support in a GDSS.
39. Explain the classification of DSS.
40. Write down the barriers to development of SMIS.
41. Explain reverse engineering.
42. Define Strategic management information system . Explain external strategic system and internal strategic system?
43. Explain challenges in developing information systems.
44. Write short notes of the following
  - 1) Universal research locator.
  - 2) Plug-ins.
  - 3) GIS
  - 4) Cross-functional systems.
  - 5) RAD.
  - 6) Outsourcing.
  - 7) CASE.
  - 8) A proactive cio strategy

### **C. LONG QUESTIONS(8 marks)**

1. List four types information system and explain each one of them briefly.
2. Explain office automation systems?
3. Identify the basic components of a computer system and explain?
4. Explain the four generations of programming languages. Give an example of a language from each generation?
5. What are the types of system software? Explain each of them in detail?
6. What is file? Explain the methods to organize data in files oriented environment? Which method is the most efficient and why?
7. What is database model? Write different types of data model and explain with suitable diagram?

8. Describe the functions of a DSS.
9. Explain telecommunication system?
10. Explain Entity relationship diagram? Give an example.
11. Explain Executive information systems?
12. Explain different types of communication networks?
13. Explain briefly the sources of manufacturing information?
14. Describe the inputs and outputs of marketing information systems.
15. Describe the layers of OSI model.
16. What do you mean by marketing information? Explain the types of marketing information?
17. What do you mean by prototyping? Explain the types of prototypes? Write down the advantages and disadvantages of prototyping.
18. What is SDLC? Briefly explain with a suitable diagram.
19. What do you mean by end user computing? Explain the types of end user computing? Identify three essential activities required from managing end user computing. Explain in detail?
20. What do you mean by end-user computing? Describe different types of end-user computing.
21. Describe functional components of IRM.
22. Explain components of SCM.
23. Describe different types of e-commerce.
24. Briefly explain commerce over the internet.
25. Describe the benefits of e-business.
26. What are the opportunities of e-business?
27. Describe the models of e-governance.

## **SELECTED REFERENCES**

1. Management Information System; By: Dr A. K. Gupta (S.Chand & Company Ltd)
2. Management Information System; By: W.S Jawadekar(TMh)
3. Management Information Systems ;By: Giridhar Joshi(oxford)