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MANAGEMENT INFORMATION SYSTEM

"Modern Perspective"

First Edition

BY

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Preface

The objective of this book is to introduce students of Computer Sciences, Accountancy & Finance, Business Administration, Statistics and Food Technology, of Nigeria Polytechnics and Colleges of Technology to modern Management Information System and Its Application.

This book provides basic theoretical and practical information on all aspect of Management Information System for the departments mentioned. The contents of this book have no contradiction to Curriculum and Course Specification produced by the National Board for Technical Education (NBTE) UNESCO – Nigeria Project.

The book will be very useful for the readers of different categories as in undergraduate students of University, Polytechnics, Colleges of Education and Allied institutions in areas of computer science, management science and other related disciplines.

There is no doubt that this book will be very useful to all categories of readers. In case of any positive contrary or suggestion for improvement in the next edition of this book you may call 08094204341 or e-mail engryekini@yahoo.com.

Authors 2013

Instruction for the Users of This Book

The users refer to in this page are Students and Lecturers. Students of HND accountancy have MIS as a course been taken in their year 1 first semester as MIS1 (ACC317) and second semester as MIS2 (ACC327). Other departments such as Computer, Food Tech, Statistics, Business Administration has MIS once, either in first semester or second semester.

The Curriculum and Course Specifications vary from one Department to another as a result users are advised to use Curriculum and Course Specifications for their course as reference guide to usage of this book as an instructional material for management information system.

Meanwhile, Chapter 1 to 12 covers the syllabus for MIS1 and Chapter 13 to 23 covers the syllabus for MIS2 for HND Accountancy and Finance.

Acknowledgement

First of all we are very grateful to God almighty. This book evolved from author's experiences in teaching and research in Computer Science and Technology. There are some individuals that contributed to the success of the research that gave birth to this book.

We acknowledged all staff of Department of Computer Technology; they are all wonderful to us during the process of compiling this book.

We acknowledge the contribution of the management of Yaba College of Technology for providing enabling environment for research and publication in the college.

We also acknowledge members' of staff of Yeknua ICT & Educational Research-Publication Center.

Finally, we acknowledge the contribution of our wives and children for their prayer and endurance has made this project a realistic one.

Thank you all.

This Book Belongs To

Name

School

Department/Date

Signature

General Objectives

On Completion of This Course Readers Should Be Able To

1. Understand Management Information System
2. Understand Software System
3. Understand Programming
4. Understand System Analysis and Design
5. Understand the Internet
6. Understand the uses of Information in Management Decisions.
7. Understand Management Information System (MIS)
8. Understand Components of Management Information System.
9. Understand the Concept System
10. Understand General Information Services

Contents

Chapter 1
Data, Information & Knowledge

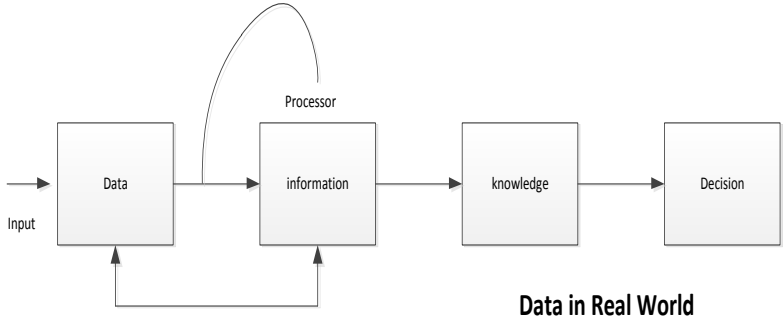
1.1. Meaning of Data, Information and Knowledge

The terms Data, Information and Knowledge are frequently used for overlapping concepts. The main difference is in the level of abstraction being considered. Data is the lowest level of abstraction, information is the next level, and finally, knowledge is the highest level among all three.

Data is raw, unorganized facts that need to be processed. Data can be something simple and seemingly random and useless until it is organized. E.g. each student's test score is one piece of data. Data is an abstract concept that can be viewed as the lowest level of abstraction from which information and then knowledge are derived.

Data in themselves are fairly useless. But when these data are interpreted and processed to determine its true meaning, they become useful and can be called Information. Data is/are the facts of the World. For example, take yourself. You may be 6ft tall, have black hair and yellow eyes. All of this is "data". You have black hair whether this is written down somewhere or not.

Data can be thought of as a description of the World. We can perceive this data with our senses, and then the brain can process this. Human beings have used data as long as we've existed to form knowledge of the world. Until we started using information, all we could use was data directly. If you wanted to know how tall I was, you would have to come and look at me. Our knowledge was limited by our direct experiences. Information allows us to expand our knowledge beyond the range of our senses. We can **capture data in information**, and then move it about so that other people can access it at different times. Information is a critical resource in the operation and management of organizations. Timely availability of relevant information is vital for effective performance of managerial functions such as planning, organizing, leading, and control.



Data in Real World

The diagram could be explained further as follows;

i. **Data** → processing → **Information**
ii. **Information** → intelligence → **Knowledge**
iii. **Knowledge** → experience → **Wisdom**

1.2. Attributes of Information

1. Usability

i. Relevant: Relevance is yet another key attribute of management information. Information is said to be relevant if it answers specifically for the recipient what, why, where, who and why? In other words, the MIS should serve reports to managers, which are useful, and the information helps them make decisions.

ii. Simple: good information should not be too voluminous; it should contain only the relevant facts, without leaving out any necessary details.

iii. Flexible: Data should able to adapt to new situation: able to change or be changed according to circumstances.

iv. Economical/cost-effective: Cost-effective: the value to be derived from the use of good information should surpass the cost of obtaining such information.

v. Exception based: Top managers need only exception reports regarding the performance of the organization. Exception reporting principle states that only those items of information, which will be of particular interest to a manager, are reported. This approach results in saving precious time of the top management and enables the managers to devote more time in pursuit of alternatives for the growth of the organization.

vi. Explicitness: A report is said to be of good quality if it does not require further analysis by the recipient for decision-making. Thus the reports should be such that a manager does not waste any time on the processing of the report, rather he should be able to extract the required information directly.

2. Quality

i. Accurate: Accuracy is another key-attribute of management information. It means that information is free from mistakes and errors, is clear and accurately reflects the meaning of data on which it is based. It conveys an accurate picture to the recipient, who may require a presentation in graphical form rather than tabular form.

ii. Verifiable: There must be means to check whether the data is true either by examination, investigation, or comparison.

iii. Complete: The information, which is provided to a manager, must be complete and should meet all his needs. Incomplete information may result in wrong decisions and thus may prove costly to the organization.

iv. Adequate: Adequacy means information must be sufficient in quantity. MIS must provide reports

containing information, which is required in deciding processes of decision-making.

v. Reliable: content of good information should be such that the user can rely upon. Relevance: good information should be relevant to the subject it is required for.

3. Delivery

i. Timely: Timeliness means that information must reach the recipients within the prescribed time frame. Timeliness refers to the currency of the information presented to the users. Currency of data or information is the time gap between the occurrences of an event in the field until its presentation to the user (decision maker). Timely information can ensure correct executive action at an early stage. The characteristic of timeliness, to be effective, should also include current information.

ii. Accessible: Data must be easily reached i.e. easy to enter or reach physically, easily understood without specialist knowledge, and easily available to be obtained, used, or experienced without difficulty.

1.3. Value of Information

Information has a great impact on decision making, and hence its value is closely tied to the decisions that result from its

use. Information does not have an absolute universal value. Its value is related to those who use it, when it is used, and in what situation it is used. In this sense, information is similar to other commodities. For example, the value of a glass of water is different for someone who has lost his way in Arctic glaciers than it is to a wanderer in the Sahara Desert.

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

1.4. Information System versus Information Technology

1.4.1. Description of Information System

Information has to flow from its source to an individual who can use it, hence some type of system, physical or otherwise, is required to collect, store and move the information within an organization. That system, physical or otherwise is refers to as Information system. **Information system (IS)** can be defined as a set of procedures that collects or retrieves, processes, stores and disseminates information to support organizational decision-

making and control. Information System can be manual or computer-based.

Manual information System: This is a type of information system that does not use information technology or any computer devices. All data would be kept in other ways, mainly paper. As a few examples: Before accounts, payroll and spreadsheet applications, people would have worked out this kind of information on paper. People would have handwritten letters or used typewriters instead of word processors. Graphs and diagrams would have been drawn by hand instead of using computer software to do them.

Computer-based Information Systems

A computer-based information system (CBIS) is an information system that uses computer technology to perform some or all of its intended tasks. Such a system can include as little as a personal computer and software. Or it may include several thousand computers of various sizes with hundreds of printers, plotters, and other devices, as well as communication networks (wire-line and wireless) and databases. In most cases an information system also includes people.. Compute-based information systems have been in widespread use since the 1990s in industry, non-profit organizations and government agencies. These systems provide fast, centralized access to databases of personnel information, reference reading, best practices and on-the-job training, and are easily customizable to meet an organization's needs. With the

Internet and technology boom of the early 21st century, use of computer-based information networks is growing faster each year.

Differences between Manual & Computer-Based Information system

1. Basically a manual-based information system is one that does not rely on any computerized systems and a computer-based information system does.
2. A manual-based system will see information recorded and kept in different ways such as in files in paper form. Whereas a computer based information system will see data stored on various computer programs including on databases, Word documents, Excel etc.
3. In recent times, computer-based systems are generally considered to be more popular as more businesses are choosing to keep up with the developments in information technology. There are still those who continue to use manual systems though, perhaps as a matter of financial constraints or it may simply be more suitable for their type of business.
4. A manual-based information system is generally considered to be cheaper than a computer-based system.
5. A computer-based information system may be considered to be more cost effective and efficient than a manual

system. It speeds up operations and can back up important information at the touch of a button. It is however very expensive to set up and may need to be maintained by IT technical support advisors on a regular basis.

1.5. Determining factors for Information System Choice

The choice of information system to be used or adopted by a business organization could be determined based on;

- Whether an information system can be improved by including IT-based processing capability.
- If a manual system can perform a task efficiently and without error, there may be little reason to use IT.
- Managers more commonly find that the volume of work grows, procedures increase in complexity, or activities become more inter-related and/or dispersed geographically. Then the introduction of computer-based information system can make improvements.

1.6. Information Technology (IT)

Information technology is a contemporary term that describes the combination of computer technology (hardware and software) with telecommunications technology (data, image, and voice networks).Information Technology is at the root of information systems; often there is confusion between Information System and Information Technology.

To clarify this, information systems are 'applications' having **functionalities** which can be exploited by the business and information technology provides **capabilities** which enable these applications. For example, telecommunication is the technology that enables a computer to communicate with a remote terminal. This communication function could be used by an organization by placing these terminals at customers' sites thereby allowing customers to use an organization's computer for a variety of purposes such as order entry or inquiring order status. Thus, information systems are the **ends** and information technology is the **means**.

1.7. Information System and Information Technology Strategies

Due to the interrelationship between Information Technology capabilities, Information System functionalities, and information use, an organization has a great range of choices concerning what it will accomplish through Information Technology and how these tasks will be done.

Organizations, therefore, need to make their choices in the form of IS and Information Technology strategies to ensure gains from their Information Technology investments. The terms Information System strategy and Information Technology strategy refer to the direction in which the organization wants to go in

relation to application information Technology and information system.

- The issue of what should an organization do with the technology is termed Information System strategy. Information System strategy is concerned primarily with aligning Information System development with business needs and with seeking strategic advantage from it.
- The question of how they do it is termed Information Technology strategy. Information Technology strategy is concerned primarily with technology policies: it tackles questions of architecture, including risk attitudes, vendor policies and technical standards.

1.8. Impact of Information Technology

i- At business operations level; Information technology has enormously speeded up the flow-of-work in and around the organization. In turn, this has permitted possible integration in many areas such as: Teams works, End-to-end links, Electronic alliances and electronic market within an organization.

ii- At the industry level: Information Technology has a unique impact on the competitive climate by permitting a high degree of simultaneous competition and collaboration between organizations. Another unique impact of IT on competitiveness concerns the importance of standards. It is now important for an

organisation to know when to support standards and when to try to pre-empt competitors by establishing a proprietary de facto standard.

1.9. Computer-based Information System and its Components

1.9.1. Hardware

Hardware is the name given to all physical devices that make up a computer-based information system. This includes; the input device, the processor, the storage device, the output device and the data communication equipment.

1. Input devices accept data at a keyboard and then convert it to machine-sensible form or accept data that are already in machine-sensible form.
2. The processor is the main unit within the computer where instructions specified by programs are carried out. It consists of three parts, namely, the main memory, the control unit and the arithmetic/logic unit.
3. The storage is made up of the main storage and the backing storage. The main storage holds data and programs currently in use. Backing storage devices are used to provide mass storage of data and information.
4. Output devices are used to produce data and information in a humanly sensible form or in a machine-sensible form for later re-input.

5. Data communication equipment is used in the movement of data and information in coded form within the entire computer system.

1.9.2. Software

Software is the term used to describe all those programs and associated documentation that in some way can assist all users of a particular computer-based information system to make the best use of it application. This software could be either systems software or applications software.

1.9.3. Humanwares

Humanwares is hardware and software that emphasizes user capability and empowerment and the design of the user interface. It could be perceived as intermediary between the hardware and software system of a computer-based system. The process of building humanwares generally consists of these steps:

i. Define users (age, mindset, environmental context, previous product experience and expectations, and so forth) and what they really want to do
ii. Identify tasks they will need to do or capabilities they will want
iii. Specify usability objectives (if possible, these should be measurable, such as how long to do something or how

many mouse clicks to get to a specified task point) for each task or capability

iv. Build a prototype of the user interface (it can be a paper or simulated prototype if time is short)

v. Test and verify or correct the prototype

vi. Provide the prototype and usability objectives to the program designers and coders

vii. Test the code against the prototype and objectives and, if necessary, redesign or recode the software

viii. Test the product with users or valid test subjects and revise as necessary

ix. Get feedback from users and continually improve the product

Chapter 2
Computer Processing Techniques

2.1. Description of Computer Processing Techniques

Computer Processing Techniques describes the technique by which data is collected, input, transformed within the computer and the resulting information made available to the users. The various computer processing techniques are discussed as follows.

2.2. Batch Processing

2.2.1. Description of Batch processing

Batch processing is a technique in which related data and transactions are collected into groups of similar size for a defined period of time and then input and processed together at predefined periods of time. A batch is made up of a number of transactions; say on daily, weekly or monthly basis. Batches of documents are received for processing by the data control section from user departments and branches. The batches of documents are then sent to the data preparation section for keying-in onto a transaction file on disk. The transaction file is then verified and validated before it is posted.

2.2.2. The advantages of Batch Processing are:

- Batch processing provides good internal control, mainly clerical checking and reconciliation of input fields to output.
- This method produces detailed documents reports and transactions listing.
- Audit trails are adequately provided by the printing of transactions applied during updating and by the printing of the contents of files.
- Magnetic tape files may be used for sequential access to records.

2.2.3. The disadvantages of Batch Processing are:

- The technique has a built-in delay in the processing of transactions and the production of reports.
- User cannot interact with files during batch processing.
- It involves data preparation, which is a costly and time-consuming exercise.

2.2.4. Applications of Batch Processing

Batch processing operations relate to specific applications such as payroll, stock control, invoicing and sales ledger, purchases and purchase ledger, and sales ledger. Each application consists of a number of computer runs each of which is designed to accomplish a defined stage of processing in respect

of each transaction. A computer run is the operation of a program or programs involving some degree of alteration or output of the system's files.

2.3. On-Line Processing

2.3.1. Description of online processing technique

On-line processing is the technique of using computer to process data by means of terminals connected to and controlled by a central processor. On-line systems involve the receipt of data directly from the point of origin through a variety of input/output terminal devices with telecommunication capabilities. On-line processing provides direct access to information files by terminal users and also enables them to update files with transaction data.

2.3.2. The advantages of On-Line Processing:

- The use of terminals enables clerical staff to have access to the information they require for the efficient performance of their jobs.
- Routine clerical tasks are replaced by terminal operations, thereby providing a greater degree of job interest. This eliminates tedious tasks.
- The volume of printed reports is reduced as information may be displayed on terminal screens on demand. This reduces the cost of stationery.

- Terminal messages are checked for accuracy by data validation programs before being transmitted to the computer. This reduces input errors.
- Master files are more easily updated by terminal keyboard with regards to transaction data.
- The availability of management information by direct access facilities enables managers to obtain a greater degree of control over their respective operations.
- These systems eliminate the need to convert human-sensible data into machine-sensible data, thereby saving time and the cost associated with data preparation.

2.3.3. The disadvantages of On-Line Processing are:

- The cost of the large computer with powerful central processor, enormous internal memory, very large direct access backing storage, numerous terminals, data communication equipment and the sophisticated software.
- Adequate provision has to be made to prevent unauthorized terminal access and to protect the system's files from illegal processing.

2.3.4. Applications of On-Line Processing

- Banking. An on-line banking system could be used to inform bank customers of the status of their accounts, in response to an inquiry, by accessing relevant files via a terminal.

- Stock Exchange. An on-line system enables the speedy processing of share dealings among the numerous participating brokerage firms by using terminals located in their offices.
- Stock Control. By using terminals located in warehouses and stores, an on-line system could be employed for updating stock records, automatic re-ordering of stock and the monitoring of the various stock control levels.

2.4. Real-Time Processing

2.4.1. Description of Real-time processing

Real-time processing is an on-line technique which is able to receive input data from various sources and which is able to process that data sufficiently rapidly to be capable of influencing the sources of the data. In real-time commercial data processing system, source data is transmitted from terminals in widespread locations. The data is processed and the resultant reply messages are transmitted back to the terminals sufficiently quickly for on-the-spot actions or decisions to be taken.

2.4.2. The advantages of Real-Time Processing

- The use of terminals enables clerical staff to have access to the information they require for the efficient performance of their jobs.

- Routine clerical tasks are replaced by terminal operations, thereby providing a greater degree of job interest. This eliminates tedious tasks.
- The volume of printed reports is reduced as information may be displayed on terminal screens on demand. This reduces the cost of stationery.
- Terminal messages are checked for accuracy by data validation programs before being transmitted to the computer. This reduces input errors.
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- The availability of management information by direct access facilities enables managers to obtain a greater degree of control over their respective operations.
- These systems eliminate the need to convert human-sensible data into machine-sensible data, thereby saving time and the cost associated with data preparation.

2.4.3. The disadvantages of Real-Time Processing

- The cost of the large computer with powerful central processor, enormous internal memory, very large direct access backing storage, numerous terminals, data communication equipment and the sophisticated software.
- The cost is higher in real-time processing because of the inherent duplication of the computer.

- Adequate provision has to be made to prevent unauthorized terminal access and to protect the system's files from illegal processing.

2.4.4. Applications of Real-Time Processing

- Airline Reservation System. Airlines install terminals in their worldwide offices and link them to central computer complexes via communication networks. This enables them to give rapid response to inquiries about seat bookings. In addition, the computers carry out many batch processing and basic on-line jobs. These include personnel administration, payroll, accounting and stock control.
- Real-time Banking. In real-time banking, every bank clerk has immediate access to all the customers' accounts. Hence, a customer is able to withdraw cash and inquire about his account at any of the bank's branches. It also enables the bank to keep a close check on the customers' current balances.

2.5. Time-Sharing Systems

2.5.1. Description of Time-sharing Processing Technique

Time-sharing or multi-access is an on-line processing technique that enables many users to gain access to a centrally located computer by means of terminals. The terminals are usually connected to an office telephone extension and a link is established by dialling a specified telephone number. Each user is

geographically remote from the computer and from each other. Each user is also unaware that the computer is being accessed by anyone else, which creates the impression of having a computer for one's sole use.

2.5.2. The advantages of Time-Sharing Systems are:

- Can be very economical for the occasional user.
- Access to a large computer and a "rich" library of software at a relatively low cost.
- It allows several people to have immediate access to the central processor at the same time.

2.5.3. The disadvantage of Time-Sharing Systems

It is not suitable for large commercial data processing operations.

2.5.4. Applications of Time-Sharing System

Time-sharing is applied in sales invoicing, stock control, purchasing, payroll, and so on.

2.6. Distributed Processing

2.6.1. Description of Distributed Processing

Distributed processing describes a data processing system whereby several mini-computers are linked together over long distances by telephone lines and also to a mainframe computer in order to form a communication network. The mainframe, usually

located at the organisation's head office, can collect summarized information from each of the distributed machines and store it on a company-wide database.

2.6.2. Advantages of Distributed Processing are:

- Data can be processed at a number of locations independently.
- Individual users can access their own data with minimum constraints and may be able to communicate with others.
- The frequency of data transmission and its associated cost is reduced, since data files are decentralised.
- Systems control can be more efficiently accomplished. Any breakdowns or loss of files would be restricted to particular locations.
- There is no need for special air-conditioning or environmental control. Mini and microcomputers can be operated under normal office environment.
- It is more economical to install minicomputers or microcomputers at each of the different locations rather than concentrate on one central mainframe computer.

2.6.3. Disadvantages of Distributed

- Possible duplication of data records at each location.
- It will be more difficult to ensure adherence to strict data processing standards since the processing at the different

locations are not likely to be under the control of one data processing manager.

- Lower capability of minicomputer and microcomputers compared to mainframes, in terms of speed, memory, peripherals, software, etc.

2.7. Centralized Processing

2.7.1. Description of Centralized Processing

Centralised processing describes a system whereby a business organisation uses only one large computer for all the data processing functions within the business. Such organisation is usually a widely dispersed conglomeration of various types of operating units, including factories, warehouses and sales offices.

2.7.2. Advantages of Centralised Processing are:

- Economy of capital expenditure due to high cost of computers through having only one computer for use by the group instead of several units located in the various departments.
- If one powerful computer is implemented, the result will be increased speed of operation, higher storage capacity and more powerful processing capability.
- Economy in computer operating costs due to the centralisation of data processing personnel as compared to the level of cost that would be incurred if these resources were to be duplicated in each department of the group.

- Centralisation would also facilitate the standardisation of applications and ensure strict adherence to data processing standard.

2.7.3. Disadvantages of Centralised Processing are:

- The complex central computer would require specialised environment with costly air-conditioning.
- A breakdown of the central computer will seriously affect the entire operations of the organisation.
- Centralisation does not facilitate user involvement.

2.8. Decentralized Processing

2.8.1. Description of Decentralised Processing

Decentralised processing is a data processing technique that involves divisional breakdown of computing resources. In decentralised processing, each division or branch of a business organisation owns its data processing system and handles its own processing needs independent of the head office or any other division or branch. The individual computer systems do not generally interact.

2.8.2. Advantages of Decentralised Processing

- Decentralised processing is useful where branch autonomy is very important.
- Individual branches can access their own system without constraints.

- Any breakdown or loss of files will be restricted to particular branches.
- Systems control can be more efficiently accomplished.

2.8.3. Disadvantages of Decentralised Processing

- The duplication of facilities increases costs.
- It will be more difficult to ensure adherence to strict data processing standards, since each branch will have its own data processing manager.

Chapter 3
Computer Programming

3.1. Description of Computer Programming

The series of activities involved in developing/producing computer programs is called Programming. Computer uses different types of programming languages. A prominent purpose of programming languages is to provide instructions to a computer. As such, programming languages differ from most other forms of human expression in that they require a greater degree of precision and completeness.

3.2. Features of Good Computer Programs

Some features of good computer programs are discussed below.

- **Workability** remains the most important qualities of any application. A program should work and should do what the user expects from it. Unfortunately many software projects (according to statistics, 80% or even more) didn't result in shipping an appropriate software product to meet the design goals.
- **User-friendliness:** user-friendly interface is becoming more and more important. Graphical user interfaces (GUI)

are evolving, and the customers just will not use an application with obsolete or uncomfortable user interface. Such "minor" issues as improperly aligned text labels, or "forgetting" the previous text entered into a textbox may lead to big waste of time by a clerk; say, at a post-office who uses the application for a whole working day. For example, one of the main reasons of great success of Microsoft Visual Studio is its excellent and "intelligent" user interface.

- **Reliability:** This quality and viewpoints to it have come from hardware development. There are two possible viewpoints on reliability: (1) reliability measure is the amount of time the application has been working without any faults; (2) reliability of a programming or component is its ability to handle incorrect input and behave reasonably well when it occurs. Both of the points are very important.
- **Security:** This is especially important now that a lot of hackers and crackers are trying to crush servers and databases. All modern widely used applications should have special architectural design and implement special checks and measures to enable data and application security. The most important and state-of-the-art example of security technology is Microsoft.NET with its role-based security and code access security.

- **Code Reusability and component-based programming:** In early days of programming, software engineers had to develop each part of their applications from scratch because of the poor design and documentation of the already existing software libraries. Now, due to principles of abstract data types, modular programming and object-oriented programming, big progress has been achieved in developing ready-to-use programming components; and most of the applications are assembled from them. Most popular examples are: components in .NET, C#, and Java Beans.
- **Modularity:** This is a very important architectural feature of an application. Program modules are small units of a large program which implement some definite/specific parts of the functionality of the large program, and having strictly defined interfaces to one another. Modular programming is the design and implementation of an application program as a hierarchy or a collection of modules. Modularity is a good basis for reliability, readability and maintainability of applications.
- **Efficiency**: This was considered to be the main quality of applications when the hardware was not so powerful. The concept of efficiency should be always considered in relation to some definite efficiency criteria such as: maximizing runtime performance, minimizing the

amount of memory used, etc. It is not possible to meet all the efficiency criteria at once. While saving memory, we may lose performance, and vice versa. Efficiency is now still very important for a number of the kinds of applications: operating systems, real-time systems, embedded systems, in general – for system software. For the majority of applications, efficiency is not as important as, say, user-friendly interface. Efficiency for such applications should not be achieved at the expense of readability, clarity and modularity.

- **Portability:** This is the ability of an application to run the same way on different platforms. Most of the applications, no matter whether they are implemented in "platform-independent" languages, are actually not portable for a number of reasons. Applications dealing with numerical computations deliver different results on different platforms because of different hardware implementation of numbers and their different bit width. Applications dealing with GUI don't provide the same appearance and functionality of GUI widgets because they are based on different GUI libraries on different operating systems. A possible approach to achieve portability is to implement a platform-independent abstract machine for the language implementation, like in Java. But the Java motto "write once, run everywhere (WORA)" may appear to become a

limitation when an application tries to use all the available native data representation features on each platform. In this respect, the approach of Microsoft.NET looks more practical than in Java: on .NET, it is allowed to use not only fixed-size numbers (like int32) but also native implementations of numbers (like native int).

- **Readability and maintainability:** are very important "internal" qualities of applications, not explicitly visible to the users, but extremely important to software developers for successful maintenance, updating and further development of software products. Even if a software product was initially very well designed and coded; later, because of many different engineers or even companies with their own different styles participating in its maintenance, the source code of the product is likely to turn into a kind of a "cocktail" of quite different architectural approaches. Generally speaking, the recipe to achieve good readability and maintainability is to follow the same design and coding style and patterns, though people tend to have a variety of different individual styles in everything, including software development.

3.3. Stages Involve in Programming

The stages involve in computer programming can also be refers to as programming life cycle. It can be divided into 3 as discussed below

1. Problem-Solving Phase
- Analysis and Specification
- General Solution (Algorithm)
- Verify
2. Implementation Phase
- Concrete Solution (Program)
- Test
3. Maintenance Phase
- Use
- Maintenance

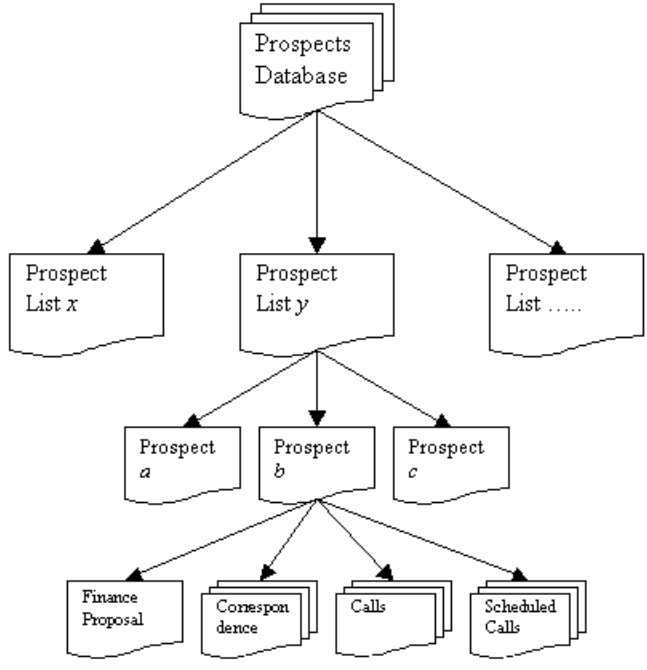
3.4. Program Structure

Computer program is targeted to providing solution to a problem. The program structure describes the model of a particular solution to problem, for example; A program is designed to be used by Telesales operators to track and monitor marketing activities for a firm. The main function or the problems to be solved by the program are:

- Controlled by importing and entering prospects. It then assists with calling

- Promoting the company's products and/or services to prospective customers.

The program must be structure to reflect the solutions and the diagram below reflect and demonstrate the overall structure of software.



3.5. Design Algorithm/Flowchart

3.5.1. Description of Algorithm

An algorithm is a set of instructions or procedural steps, which if carried out results in the solution of a specific problem. Algorithms may be represented in many forms, e.g. written in

English or Pseudocode, using mathematical notation or using a computer programming language.

3.5.2. Properties of Algorithm

The properties of an Algorithm are:

1. An algorithm has a beginning and an end.
2. It terminates after a finite number of steps or has a finite number of iterations.
3. An algorithm must be sequentially and logically ordered.
4. It may have forward and/or backward loops.
5. An algorithm must be unambiguous.
6. It may not contain any redundancy.

3.5.3. Advantages of Algorithms

The advantages of an Algorithm are:

1. An algorithm is an aid to problem definition.
2. It is an aid to writing computer programs.
3. It helps to simplify the logic of a program or process.
4. It is more complete than a decision table.
5. It can be used to test whether the logic of a program works.

3.5.4. Solving Problem with algorithm

- **Example 1**

Write and algorithm to find sum of 2 numbers using calculator

Solution

An algorithm to find the sum of two numbers using a calculator could be written as follows:

Step 1. Enter the first number.

Step 2. Press the "+" key.

Step 3. Enter the second number.

Step 4. Press the "=" key.

- **Example 2**

In Nigeria Karakata Company Ltd, full-time employees, during normal working hours is 8 hours per day and 40 hours per week (MaxNoOvertime). For all hours worked in a week over (these 40 hours a week) the company must pay its employee (with overtime working) one time and half (BonusRate) the normal salary per hour. The employees that earn a salary more than 150€ per week must pay a supplemental tax of 25% (due) from what is more than 150€ (MaxNoDue). Write a pseudocode/flowchart to compute an employee's overtime pay and net pay.

Solution

Available information

We know:

MaxNoOvertime=40h

BonusRate=1.5

MaxNoDue=150€

Due=25%

Required:

GrossPay=?

NetPay=?

Steps to solve the problem are:

S1. Start;
S2. Initialize the known variables: max hours worked with no overtime (MaxNoOvertime), bonus rate for overtime hours (BonusRate),
non taxable payroll amount (MaxNoDue), tax rate (Due);
S3. Enter hours worked overtime (HoursWorked) and hourly rate (HourRate);
S4. If (HourWorked-MaxNoOvertime)<=0 Then
GrossPay=HoursWorked*HourRate;
Else

GrossPay=HourRate*(MaxNoOvertime +
BonusRate*(HoursWorked-MaxNoOvertime));
S5. If GrossPay<=MaxNoDue Then
NetPay=GrossPay;
Else
NetPay=GrossPay-Due*(GrossPay-MaxNoDue);
S6. Display GrossPay, NetPay;
S7. End.

3.6. Flowcharts

3.6.1. Description of Flowchart

Flowcharts are means of describing a system or program in diagrammatic form by showing the sequence of steps in the system or program and the relationships between it is a type of diagram that represents an algorithm or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows. This diagrammatic representation can give a step-by-step solution to a given problem. Process operations are represented in these boxes, and arrows connecting them represent flow of control.

3.6.2. Types of Flowcharts

There are five basic types of flowcharts, namely, Blockcharts, Systems Flowcharts, Procedure Flowcharts, Program Flowcharts and Computer-run Charts.

1. Block charts: A block chart shows the sequence of the main procedures in a system. The chart gives a broad picture only; it contains no details of how each procedure is carried out.
2. Systems Flowcharts: A systems flowchart shows the overall logic of the systems processing. It gives a picture of what the system does and not how it is done. Systems flowcharts are useful in analysing an existing system with a view to improving it and in communicating existing systems to interested parties such as management and programmers
3. Procedure Flowcharts: A procedure flowchart shows details of the operations that are performed in a group of related documents within a defined clerical procedure, section or department. It shows all the documents that come into the section, the operations carried out, the staff responsible for the operation, the frequency of the operation, the destination of all documents including those generated during clerical operations in the section. Procedure flowcharts are useful in the understanding and assessment of manual systems before computerisation and in communicating the features of existing procedures to all interested parties.
4. Program Flowcharts: A program flowchart shows how procedures are to be carried out by the computer. It shows in details the logical steps to perform the particular task

for which a program has been written. Program flowcharts are generally produced in two stages representing different levels of details. An outline (or macro-level) flowchart shows the major logical processing steps within a program. It is usually prepared first and serves as a guide for drawing the detailed flowchart. A detailed (or micro-level) flowchart shows the processing logic at its finest level of detail and usually has a higher degree of logical complexity. It is the one most often used as the programmer's guide for coding. Program flowcharts are useful in providing a systematic method of working out the processing logic of a program, in documenting the logic for the programmer to use as a guide for coding and debugging, and in communicating with other interested parties who will have to understand the program at some later date.

5. Computer-Run Charts: A computer-run chart shows the sequence of computer programs to be performed, with their inputs, outputs and files, for a defined application such as payroll or sales invoicing. It is useful for communication between the systems designer and the programmer.

3.6.3. Advantages of using Flowcharts

1. Flowcharts are visual aids for communicating the logic of the system/program to all concerned.

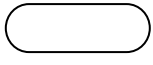
2. Flowcharts can be used to present the system as a totality without any loss of details.
3. Flowcharts facilitate the analysis of a system by revealing duplicate or redundant activities.
4. Control features or their absence may be highlighted by the use of designated symbols.

3.6.4. Disadvantages of using Flowcharts

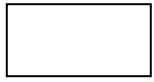
1. Flowcharts quickly become confused (cluttered) where the logic of the system is complex.
2. Where alterations are required, the flowcharts may require redrawing completely.
3. Reproduction of flowcharts is difficult, as some of the symbols might be difficult to type.
4. It is not always clear, when looking at an action to be taken, exactly what the conditions are for that action to result.

3.6.5. Flowchart Symbols

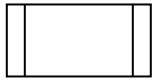
Flowcharting is usually done with a template especially designed for programmers. The symbols used are as follows.



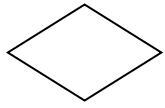
Terminal. Used as the first or last symbol in a flowchart to indicate Start/Stop, Enter/Exit, etc.



Process. Used to represent any kind of processing activity.



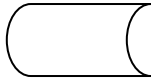
Pre-Defined Process. Used to represent a process which has been set out in detail elsewhere.



Decision. Used where a decision has to be made in selecting the subsequent path to be followed.

Input/Output. Used to represent data available for input or information output from processed data.

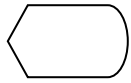
Connectors. Exit to, or Entry from, another path of the flowchart or a page.



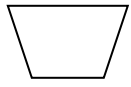
Online Storage. Input/Output using any kind of online storage, such as magnetic tape, and magnetic disk.

Offline Storage. Storing offline regardless of recorded medium.

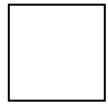
Manual Input. Data input by online keyboards, pushbuttons, etc.



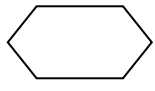
Display. Information display by online indicators, e.g., VDU.



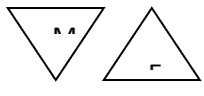
Manual Operation. Any offline process without mechanical aid (i.e. at human speed).



Auxiliary Operation. Offline performance on equipment not
under direct control of the CPU.

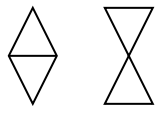


Preparation. Instruction modification to change program – initialise a routine, set a switch, etc.



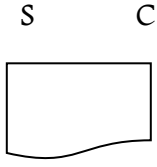
Merge (M). Combining two or more sets of items into one set.

Extract (E). Removal of one or more specific set of items from a set.

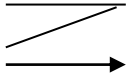


Sort (S). Arranging a set of items into sequence.

Collate (C). Merging with Extracting – forming two or more sets of items from two or more other sets.



Document



Flowline. Used for linking symbols.

3.6.6. Flowcharting Rule

The following rules should be followed when using a flowchart to solve problems

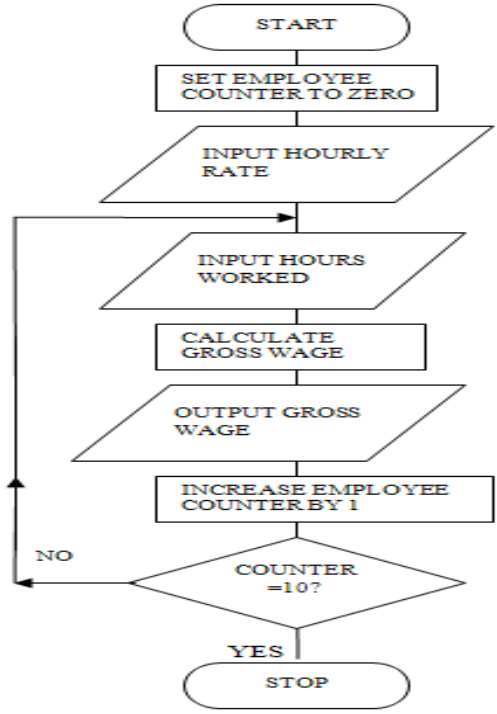
1. The general direction of flow is from top to bottom.
2. A flowline that goes up the page completes a loop or repetition of process.
3. Only one flowline should enter and leave a process symbol.
4. Only one flowline should enter a decision symbol, but two or more flowlines, one for each possible answer, should leave a decision symbol. The exit flowlines are annotated appropriately to indicate which path is to be taken.
5. Only one flowline is used in conjunction with terminal symbols. There should be only two terminal symbols in a

flowchart to mark the beginning and the end of the flowchart.

3.6.7. Flowchart Examples

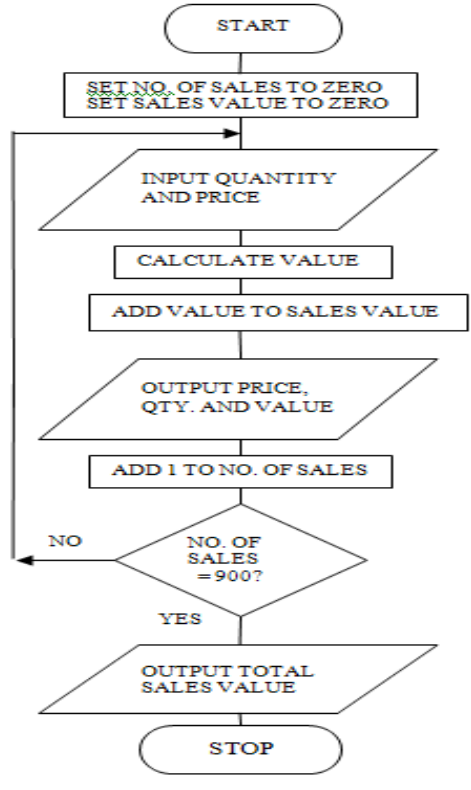
Example 1

Part of an employee's time sheet contains the hourly pay rate and the number of hours worked per week on a job. Draw a flowchart to read these details from the time sheet, calculate the gross wage and write the gross wage on the time sheet for ten employees.



Example 2

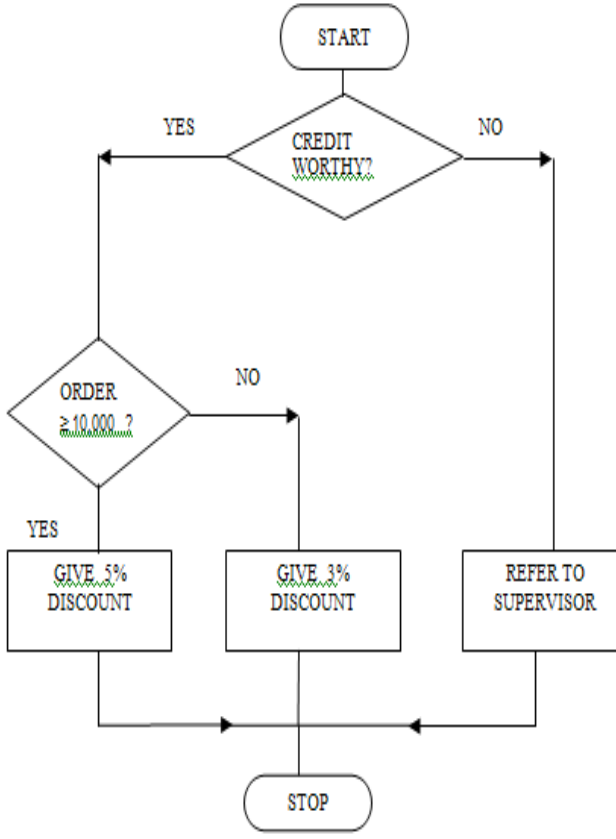
In the course of a day there are 900 sales in a supermarket. Each sale consists of the quantity of a product and the price per unit. Draw a flowchart to find the value of each sale and produce a figure for total sales value during the day.



Example 3

In assessing the amount of discount allowed on a customer's order, a clerk is required to comply with the following policy:

Any order of ₦10,000 or more received from a credit worthy customer attracts discounts of 5%, and orders of less than ₦10,000 attract discounts of 3%. Other circumstances must be referred to the supervisor for a decision. Draw a flowchart to reflect the procedure.



3.7. Program Documentation

Documentation is an important part of software engineering. Types of documentation include:

1. Requirements – Statements that identify attributes capabilities, characteristics, or qualities of a system. This is the foundation for what shall be or has been implemented. Requirements documentation is the description of what a particular software does or shall do. It is used throughout development to communicate what the software does or shall do. It is also used as an agreement or as the foundation for agreement on what the software shall do. Requirements are produced and consumed by everyone involved in the production of software: end users, customers, product managers, project managers, sales, marketing, software architects, usability engineers, interaction designers, developers, and testers, to name a few. Thus, requirements documentation has many different purposes.
2. Architecture/Design – Overview of software. Includes relations to an environment and construction principles to be used in design of software components. Architecture documentation (also known as software architecture description) is a special breed of design document. In a way, architecture documents are third derivative from the code (design document being second derivative, and code

documents being first). Very little in the architecture documents is specific to the code itself. These documents do not describe how to program a particular routine, or even why that particular routine exists in the form that it does, but instead merely lays out the general requirements that would motivate the existence of such a routine. A good architecture document is short on details but thick on explanation. It may suggest approaches for lower level design, but leave the actual exploration trade studies to other documents.

3. Technical – Documentation of code, algorithms, interfaces, and APIs. This is what most programmers mean when using the term *software documentation*. When creating software, code alone is insufficient. There must be text along with it to describe various aspects of its intended operation. It is important for the code documents to be thorough, but not so verbose that it becomes difficult to maintain them. This documentation may be used by developers, testers and also the end customers or clients using this software application.
4. End User – Manuals for the end-user, system administrators and support staff. Typically, the user documentation describes each feature of the program, and assists the user in realizing these features. A good user document can also go so far as to provide thorough

troubleshooting assistance. It is very important for user documents to not be confusing, and for them to be up to date. User documents need not be organized in any particular way, but it is very important for them to have a through index. Consistency and simplicity are also very valuable. There are three broad ways in which user documentation can be organized.

i. **Tutorial:** A tutorial approach is considered the most useful for a new user, in which they are guided through each step of accomplishing particular tasks.
ii. **Thematic:** A thematic approach, where chapters or sections concentrate on one particular area of interest, is of more general use to an intermediate user. Some authors prefer to convey their ideas through a knowledge based article to facilitating the user needs. This approach is usually practiced by a dynamic industry, such as Information technology, where the user population is largely correlated with the troubleshooting demands.
iii. **List or Reference:** The final type of organizing principle is one in which commands or tasks are simply listed alphabetically or logically grouped, often via cross-referenced indexes. This latter approach is of greater use to advanced users who know exactly what sort of information they are looking for.

5. Marketing – How to market the product and analysis of the market demand. One good marketing technique is to provide clear and memorable *catch phrases* that exemplify the point we wish to convey, and also emphasize the interoperability of the program with anything else provided by the manufacturer. For many applications it is necessary to have some promotional materials to encourage casual observers to spend more time learning about the product. This form of documentation has three purposes:-

   i. To excite the potential user about the product and instill in them a desire for becoming more involved with it.
   ii. To inform them about what exactly the product does, so that their expectations are in line with what they will be receiving.
   iii. To explain the position of this product with respect to other alternatives.

Chapter 4
Programming in Qbasic

4.1. Description of Qbasic

In the early days of computing, computer programming was a sole responsibility of the scientific elites. In 1964 at Dartmouth College, a programming language called BASIC (**B**eginner's **A**ll-purpose **S**ymbolic **I**nstruction **C**ode) was invented, to introduce fresh computer science undergraduates to the art of computer programming. In 1985 Microsoft released its own version of BASIC called QBasic with its MS-DOS 5.0 operating system. Since then, nearly every PC user owns his/her own copy of QBasic, making it a widely known language. QBasic is a very simple language to learn, and yet it can accomplish a great deal. One of its strength is to introduce people to programming without having to worry about the internal workings of the computer. With QBASIC, it is simple to create games, business applications, simple databases, and graphics. The best aspect of the language is its close resemblance to English.

4.2. Elements of Qbasic

To learn a programming language, it is important to have a thorough understanding of the basic elements of the language. The fundamental elements of QBASIC include the following:

1. Character set
2. Keywords and reserved words
3. Numeric constants
4. String constants
5. Identifiers
6. Data types
7. Operators
8. Expressions
9. Statements
10. Control structures
11. Arrays
12. Library Functions

4.3. INPUTS/OUTPUT and PROGRAM SAMPLE IN QBASIC

4.3.1. Description of inputs/output

Input is the data a user wants the computer to process for him/her. QBASIC uses INPUT statement to make the computer to read user input from the keyboard or file. On the other hand, output is the result of processing that the computer passes to the user. QBASIC uses the PRINT statement to make the computer display output on the computer screen. PRINT displays text within quotes directly, or it can display the value of a variable. The general syntax of INPUT statement is:

INPUT "Prompt" ; | , VariableList

- Prompt is an optional literal string that is displayed to guide the user as to what input data to supply. The Prompt could be followed by a comma or semicolon. A

semicolon after Prompt appends a question mark to the Prompt string.

- VariableList implies one or more variables, separated by commas, in which the input data entered from the keyboard will be stored.

4.3.2. Program Qbasic

Example 1

Write a Qbasic program to add 10 and 12.

Solution

Note: the line numbers are merely for reference purpose, they are not part of the program; QBASIC does not require line numbers. Line numbers will be omitted in our subsequent sample programs.

```
1. REM This Program adds two numbers together
2. CLS
3. PRINT "THIS PROGRAM ADDS ANY TWO NUMBERS"
4. PRINT
5. DIM Number1 As Single, Number2 As Single, Sum As Double
6. INPUT "ENTER THE FIRST NUMBER "; Number1
7. INPUT "ENTER THE SECOND NUMBER "; Number2
8. Sum = Number1 + Number2
9. PRINT
```

```
10. PRINT Number1; " + "; Number2; " = "; Sum
11. END
```

Explanation of the program

Line 1: The first statement starting with REM is a remark or comment, which informs the human reader of the program about the purpose of the program. The QBASIC translator ignores any statement line that starts with REM.

Line 2: The second statement – CLS – stands for "Clear Screen." It erases whatever was on the monitor screen before the program displays anything.

Line 3: PRINT simply displays its argument to the screen at the current text cursor location. The argument in this case is the text enclosed in quotes. However, PRINT displays text within quotes directly, or it can display the value of a variable.

Line 4: PRINT statement without anything following it tells the computer to display a blank paragraph/line.

Line 5: data declaration: Number1 and Number2 were declared as Single data type while Sum was declared as Double data type.

Line 6 and 7: asking the user to supply the input data. The 1st input will be stored in variable Number1 and the 2nd input data will be stored in variable Number2.

The statement in line 6 could be written as two statements thus:

PRINT "ENTER THE FIRST NUMBER "

INPUT Number1

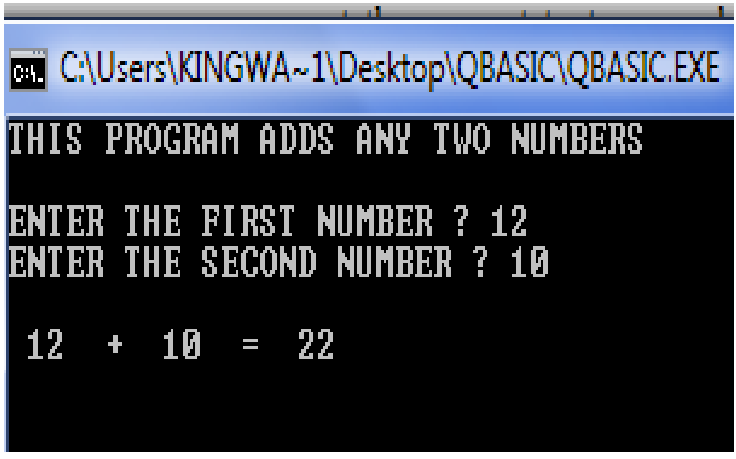
The same goes for line 7

Line 8: the computer is asked to do data processing by adding the two input data together.

Line 9: telling the computer to display blank paragraph/line.

Line 10: prints the value of the variable Number1 (1st input data), leaves a space, literally prints +, leaves a space, prints the value of the variable Number2 (2nd input data), leaves a space, and then prints the result of the addition which is stored in the variable Sum.

The output screen of the program is shown below:



The output screen shows that the user entered 12 and 10 as input data, and the computer went ahead to add these numbers and display the result according to the dictate of the program.

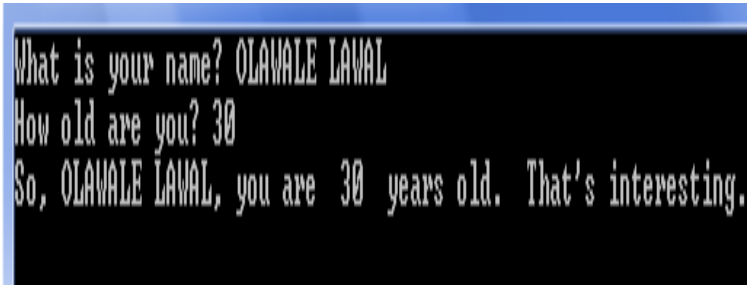
Example 2

Write a program to display your name on a screen

```
CLS
DIM YourName AS STRING, Age AS INTEGER
INPUT "What is your name? ", YourName
INPUT "How old are you? ", Age
PRINT "So, "; YourName; ", you are ";
PRINT Age; " years old.  That's interesting."
END
```

Program Explanation

The program asks the user for his/her name and assigns it to the string variable YourName. Then the age is requested and stored in the integer variable Age, and the result is printed in a sentence. Try it out! Compare your output with the sample output screen shown below:



Note that the computer actually produce the output of the two PRINT statements in the program one a single line. When a PRINT statement ends with a semicolon, it is a signal to the computer

that the next PRINT statement should display its output item on the same line continuing where the previous output stops.

Caution!: So what happens if you input I DON'T KNOW for the age prompt? You'll get a weird message that says REDO FROM START. Why? The program is trying to assign a string (text) to an integer (number) type, and this makes no sense, so the user is asked to do it over again. Another cornerstone of programming is the conditional test. Basically, the program tests if a condition is true, and if it is, it does something. It looks like English so it's not as hard as it sounds.

Example 3

Write a program to print Hello

```
CLS
DIM Selection AS INTEGER
PRINT "1. Say hello"      ' option 1
PRINT "2. Say nice tie"   ' option 2
INPUT "Enter your selection ", Selection
  IF Selection = 1 THEN PRINT "hello"
  IF selection = 2 THEN PRINT "nice tie"
END
```

The user is given a set of options, and then input a value which is assigned to the variable Selection. The value of Selection is then

tested, and code is executed based on the value. If the user pressed 1, it prints hello, but if the user pressed 2, it prints nice tie. Also notice the text after the ' in the code. These are remark statements. Anything typed after a ' on a line does not affect the outcome of the program.

Program for example 3 could also be written using the SELECT CASE structure as follows:

```
CLS
DIM Selection AS INTEGER
PRINT "1. Say hello"      ' option 1
PRINT "2. Say nice tie"   ' option 2
INPUT "Enter your selection ", Selection
SELECT CASE (Selection)
    CASE 1
        PRINT "hello"
  CASE 2
        PRINT "nice tie"
END SELECT
END
```

But what if the user doesn't input 1 or 2? What if they input 328? This must be taken into account as part of programming. You usually cannot assume that the user is expert computer user, so if s(he) does something wrong, the program should help him/her

out. So the ELSE statement comes into play. The logic goes like this: IF the condition is true, THEN do something, but if the condition is anything ELSE, then do something else. The ELSE statement is used with IF...THEN to test if a condition is anything else.

Example 4

Real Life Programming Cases

A manufacturing company has a product line that produces four items denoted by 1, 2, 3, 4, and 5. The company also has salesmen that market the products. Each salesman is paid a Basic weekly wage and additional commission which is calculated at 15% of the total weekly sale of the salesman. Write a QBASIC program that accomplishes the following:

i) Input Unit Price of each of the four items produced.
ii) Input the number of salesmen (i.e. how many salesmen are employed)
iii) Input Identity (i.e. Full Name) of each salesman.
iv) Input the Basic weekly Wage payable to each salesman.
v) Input weekly sales of each salesman for each of the four products.
vi) Compute the total weekly sales, Commission, and total Income of each salesman.

vii) Output (for each salesman) Full Name, quantity of each item sold, total sales (in Naira), Commission, and total Income, under the following heading.

S/N FULL NAME Item1 Item2 Item3 Item4 Total Sales(N) Commission(N) Income(N)

Solution

```
REM This Program inputs Salesmen Information
REM It also computes and outputs
REM their total sale, commission, and Total Income
CLS     ' Clear the screen
PRINT "This Program inputs Salesmen Information"
PRINT "It also computes and outputs ";
PRINT "their total sales, commission, and Total Income"
PRINT
REM ***** DATA DECLARATION SECTION *****
CONST ITEMS = 4 'Four different Items produced
CONST RATE = .15   'Commission rate
DIM Unit(1 TO ITEMS) AS SINGLE  ' Unit Price of each Item
DIM Num AS INTEGER      'how many salesmen
DIM BasicWage AS SINGLE
DIM I AS INTEGER, J AS INTEGER 'Counter variables

REM ***** INPUT SECTION ******
PRINT "INPUT Unit price for each item produced "
```

```
FOR I = 1 TO ITEMS
  PRINT "ITEM  "; I
  INPUT Unit(I)
NEXT I
PRINT
INPUT "Enter the Basic weekly Wage "; BasicWage
INPUT "How many salesmen are employed "; Num
DIM Code(1 TO Num) AS STRING 'Code of each salemen
DIM Names(1 TO Num) AS STRING  ' Name of each salesmen
DIM Sales(1 TO Num, 1 TO ITEMS) AS INTEGER'The sales for each item
DIM TotalSales(1 TO Num) AS SINGLE ' total sales for each salesman
DIM Commission(1 TO Num) AS SINGLE, Income(1 TO Num) AS SINGLE
PRINT : PRINT "Input the code and name of each salesman"
FOR I = 1 TO Num
  PRINT : PRINT "SALESMAN "; I
  INPUT "Staff Full Name: "; Names(I)
NEXT I
CLS
REM **** Input Salesmen Weekly sales ******
PRINT "INPUT the Weekly sales of each salesman ";
PRINT "for each of the "; ITEMS; " products "
FOR I = 1 TO Num
```

```
  PRINT : PRINT "Quantity of Sales by SALESMAN "; I
  FOR J = 1 TO ITEMS
    PRINT "Item "; J
    INPUT Sales(I, J)
  NEXT J
NEXT I
REM **** PROCESSING SECTION - COMPUTATION OF INCOME
*****
FOR I = 1 TO Num
  TotalSales(I) = 0!
  FOR J = 1 TO ITEMS
    TotalSales(I) = TotalSales(I) + Sales(I, J) * Unit(J)
  NEXT J
  Commission(I) = RATE * TotalSales(I)
  Income(I) = BasicWage + Commission(I)
NEXT I
REM ******* OUTPUT SECTION *******
CLS : Format$ = "###,###.##"
PRINT "S/N  FULL NAME          Item1 Item2 Item3 Item4 "
PRINT "TotalSales Commission Income"
PRINT "                                        (N)       (N)      (N) "
DIM K AS INTEGER ' Tab position for the items sold
FOR I = 1 TO Num
  PRINT TAB(2); Code(I); TAB(5); Names(I);
  K = 25
```

```
  FOR J = 1 TO ITEMS
    PRINT TAB(K); Sales(I, J);
    K = K + 6
  NEXT J
  PRINT USING Format$; TAB(50); TotalSales(I);
  PRINT USING Format$; TAB(61); Commission(I);
  PRINT USING Format$; TAB(72); Income(I)
NEXT I
END     ' End of the program
```

Chapter 5
System Development Life Cycle

5.1. Description of System Development Life Cycle

System development life cycle can be described based on the following:

5.1.1. Growth of Organization

The growth of organizations often necessitates the development of new systems. These systems are often required either as solution to some problems or in preparation for new opportunities and challenges.

The decision to change the information system of an organization may have derived from one or several causes, such as inaccurate information, the need to have a more integrated system combining the information requirements of all management, or the need for a quicker or more complete information etc.

The term system development life cycle in this case describes the activities that go into producing an information systems solution to organizational problems or opportunities. It is the creation of new or amended information system, which should satisfy the terms of reference of the project.

5.1.2. Software Developer/Software engineer

The systems development life cycle (SDLC), to a software developer p and software engineering, is a process of creating or altering information systems, and the models and methodologies that people use to develop these systems. In software engineering, the SDLC concept underpins many kinds of software development methodologies. These methodologies form the framework for planning and controlling the creation of an information system.

5.1.3. System Analysts

The system analyst perceive the Systems development life cycle (SDLC) as a process used by a systems analyst to develop an information system, training, and user (stakeholder) ownership. The SDLC aims to produce a high quality system that meets or exceeds customer expectations, reaches completion within time and cost estimates, works effectively and efficiently in the current and planned Information Technology infrastructure, and is inexpensive to maintain and cost-effective to enhance.

5.1.4. Business Information System experts

Information systems activities revolved around heavy data processing and number crunching routines". The systems life cycle (SLC) is a methodology used to describe the process for building information systems, intended to develop information

systems in a very deliberate, structured and methodical way, reiterating each stage of the life cycle. The systems development life cycle, is used to develop large scale functional business systems in an age of large scale business conglomerates.

5.2. Phases of system Development Life Cycle

A Systems Development Life Cycle (SDLC) adheres to important phases that are essential for developers, such as planning, analysis, design, and implementation. These phases are briefly explained as follows:

5.2.1. **Feasibility Study:** The objective of phase 1 is to conduct a preliminary analysis, propose alternative solutions, describe costs and benefits and submit a preliminary plan with recommendations. Conduct the preliminary analysis: in this step, you need to find out the organization's objectives and the nature and scope of the problem under study. Even if a problem refers only to a small segment of the organization itself then you need to find out what the objectives of the organization itself are. Then you need to see how the problem being studied fits in with them.

5.2.2. **System Analysis:** Defines project goals into defined functions and operation of the intended application. Analyzes end-user information needs.

5.2.3. **System Design:** Describes desired features and operations in detail, including screen layouts, business rules, process diagrams, Pseudocode and other documentation.

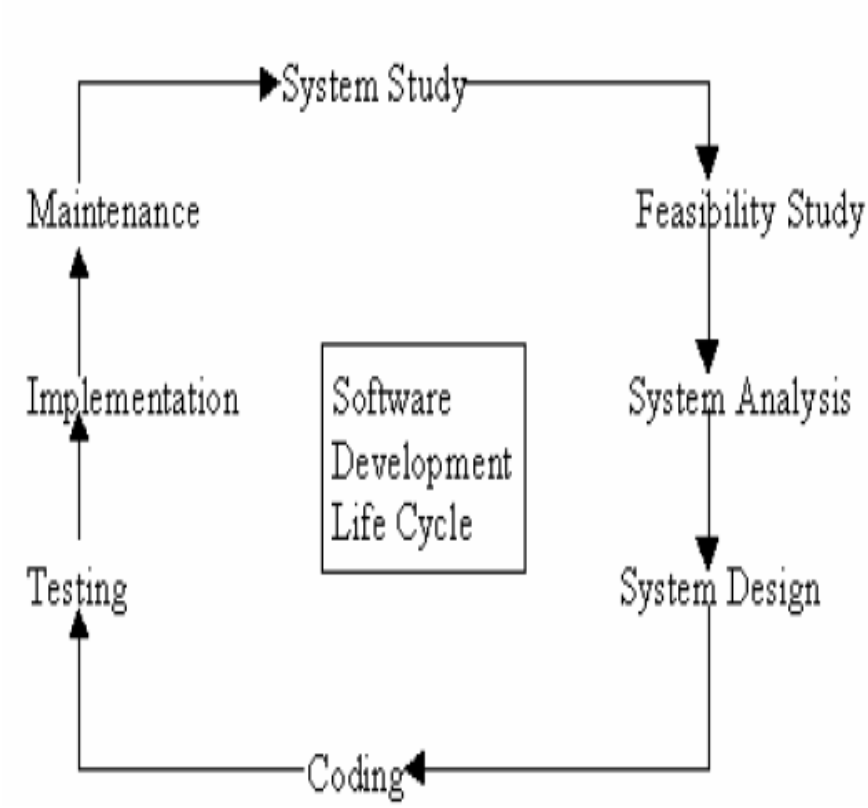
5.2.4. **System implementation:** The real code is written here and brings all the pieces together into a special testing environment, then checks for errors, bugs and interoperability., the system then put into production and runs actual business.

5.2.5. **System maintenance/evaluation:** This describes what happens during the rest of the software's life: changes, correction, additions, moves to a different computing platform and more. This is often the longest of the stages.

Note: the phases are of SDLC were full discussed in the subsequent chapters

5.3. Modeling System development Life cycle

The concept SDLC can be model as shown below:



Chapter 6
System Feasibility Study

6.1. Description of Feasibility Study

Feasibility study is a preliminary study that investigates the information needs of prospective users and the objectives, constraints, basic resource requirements, costs, benefits and viability of a proposed information system project.

Feasibility study involves limited investigation and analysis of the problems and the alternatives to the current system so that management can take a decision as to whether to commit resources (time, money, hardware, software, expertise etc.) to the project. The purpose of feasibility study is to analyze the problems of existing systems, define the objectives to be attained by a solution, and evaluates various solution alternatives for management consideration.

6.2. Scope of Feasibility study

The scope of feasibility study entails the following:

i. Defining the time and extent for the implementation of the required solution.

ii. Establishing optimum solution for meeting business needs and general information resource requirements.
iii. Finding out if the existing system can correct the situation with or without modifications or a new system is necessary.
iv. Identifying Information Technology (IT) products that offer solution to the problem.
v. Estimating the cost to develop the system.
vi. Agreeing on how well the proposed solution fits the business strategy.

6.3. Stages of Feasibility study

The feasibility study can be split into the following stages:

6.3.1. Formation of Steering Committee: A Steering Committee is a collection of members from the various user departments within the organization. It is not biased towards one particular functional area of the business. If an organizational Steering Committee does not exist, then a specific Steering Committee will be set up. The Steering Committee or the Board of Directors must relate the feasibility study proposed to the original project objectives.

6.3.1.1. Members of a steering committee

i) The information director or a senior information system staff member.

ii) An accountant for technical financial advice relating to cost and benefits.

iii) Senior management staff of each user department.

6.3.1.2. Tasks/Functions of the Steering Committee

1. To create the terms of reference for the project teams.
2. To approve (or reject) projects whose total budgeted cost is below a certain limit and so within their authorization limit.
3. To recommend projects to the board of directors for acceptance when their cost is high enough to call for approval at board level.
4. To establish company guidelines within the framework of the IT strategy for the development of computer based processing and management information systems.
5. To set up feasibility study groups to investigate and report on existing data processing systems and to make recommendations for their improvement or for a new development. The steering committee would be responsible for the compositing and the appointment of the members of each feasibility study group.
6. The evaluation of the feasibility study reports and systems specifications
7. Monitoring and controlling individual development projects e.g. monitoring progress and actual costs

compared with budget.

8. Ensuring that projects are worth their cost i.e. that their benefits (Financial or otherwise) outweigh their costs.
9. Possibly, to authorize capital expenditure on new hardware or software packages
10. To Monitor and review each new system after implementation of whether the system has met its objective. If it hasn't to investigate the reasons for the systems failure and take any suitable control or remedial measures.
11. In an organization which has a continuing program of new DP project, assessing the contribution or each project to the long term corporate objectives of the organization, ranking project in order of priority and assigning resources are available.
12. Set a tentative target date for eventual completion of the project.
13. Provide leadership at senior level for the utilization and management of IT.

6.4. Members of feasibility study team and their Function

1. At least one member from each user department in the company:- to provide useful data/information to the committee concerning their various departments, e.g.

volume of data, urgency of information, frequency of data, source/type of data etc.

2. A member of the Board of Directors: - to confirm the financial position of the organization to the group and preparedness of the company to face computerization project and to confirm the group's financial report to the Board.
3. A Senior System Analyst:- to lead other members of the group in fact finding.
4. And outside consultant:- to complement the experience of the system analyst and to ensure integrity and accuracy of information for the system.
5. A certified Accountant:- to provide financial and technical advice relating to costs and benefits.
6. Planning the study
7. The study team should draw up a Programme of work, with clearly defined timescale and line of responsibility. A level of flexibility should be built into this.

6.5. Assessing feasibility

Before a project can be considered feasible, it should be justified on the following grounds:

1. Technical Feasibility:- this is concerned mainly with specifying the performance requirement of the system, which include availability of equipment, software, and technological know-how to capable of dealing with the users' demand, volume of

transaction and required response time without any disruption to business operations.

2. Operational Feasibility:- considers whether the proposed system solution is desirable within existing managerial and organization framework; it assesses the willingness and ability of the management, employees, and clients to operate and use the proposed system. That is, it assesses the general impact of the proposed system on the organization as a whole.
3. Social Feasibility:- this indicates how well the proposed system supports the objectives of the organization's strategic plan for information systems. It studies the way the system will affect organizational structure, attitudes as well as decision-making and operations. For example, (1) the proposed system should not threaten industrial and personnel relations and motivation; (2) the system must not conflict with the corporate culture and ways of doing business; (3) the skill and competence within the organization must be at a level high enough to be able to cope with the complexities of the system.
4. Economic Feasibility:- this could also be referred to as cost/benefit analysis. It appraises whether the benefits derivable from the proposed system outweighs the cost, thus presenting a clear understanding of the business value of the proposed system. It determines whether expected cost saving, increased revenue, and increased profits exceed the cost of developing and operating the system. Benefits derivable form

proposed system could be in form of savings in labor costs, faster processing, better decision-making, better customer service, error reduction.

6.6. Feasibility Study Report

At the end of the feasibility study, a feasibility report should be submitted. The feasibility report may have the following outline:

1. Introduction
2. Terms of reference – this defines the scope of the project, when it was carried out and at whose instance.
3. Description of the existing system
4. System requirements – the report should state what the requirements of the proposed system are how the existing system failed to meet them.
5. Outline of the proposed system – it should state how the proposed system will operate so as to meet the system requirements. It will specify input, output, file, hardware, software and staff requirements for operating the proposed system.
6. Implementation plan – a description of how the new system will be implemented.
7. The likely benefit derivable from the new system.
8. The expected costs of developing, implementing and operating the system.
9. A cost benefit/analysis of the proposed system.

10. Suggested software, hardware and suppliers and cost implications.
11. Staff training requirements
12. Suggested implementation timetable.
13. Information about other organizations that are using the proposed system.
14. Alternative systems considered, and the reason for rejecting them.
15. Conclusion and recommendation.

6.7. Project approval

The steering committee may approve the project (or recommend it acceptance to the Board) if it justified. A project will be considered feasible base on four feasibility criteria – technical, operational, social and economic.

Chapter 7
System Analysis

7.1. Description of System Analysis

After established the need for an information system and completed feasibility study, the next stage in the system development cycle is system analysis. The term system analysis is used to describe the activities involved in analyzing the existing system in order to define the problem or opportunities of the organization and define the requirements of the new system.

It is a very critical stage in a system development cycle, as most of the work to produce a new system is carried out here. System analysis essentially does what the feasibility study did in greater details and depth.

7.2. Stages of System analysis

The stages/activities involved in system analysis are:

7.2.1. System Investigation

Systems investigation entails three activities:

7.2.1.1. Fact finding and data collection – In fact finding, the study team must find out what the existing information system provides, and how the information is used. Methods of fact finding include: interview, questionnaire, observation of the

system in operation, measuring, elicitation, user workgroup, background research and a special purpose survey.

7.2.1.2. Fact recording – fact finding leaves the system analyst with a large volume of information, often in disordered form. The information now has to be properly recorded. Recording tools include: procedure narratives, flowcharts, decision table, and Organization and responsibility chart to analyze the data gathered in fact-finding.

7.2.1.3. Fact Evaluation – this involve the evaluation of the findings in order to learn the inadequacies of the existing system.

7.2.1.4. Fact Finding Method: This includes various mean of gathering data/information required for designing of the system.

a. **Interview:** Interviews involved face to face discussions between systems analyst and the users, specialists and other individuals with knowledge of the system. The analyst asks questions and obtains answers, comments and suggestions. Interview is an important means by which an analyst obtains information.

Approach and attitude to be adopted when conducting fact finding interview

1. The interviewer must be fully prepared for the interview, having details of the interviewee's name, job position and a plan of question to ask.

2. The interviewer must be able to adopt his approach to suite the interviewee.
3. The interviewer should never condemn the interviewee.
4. General questions should be asked first followed by specific questions on each topic area.
5. The interviewer should always bear in mind the purpose of the interview and discourage attempts to waste time or divert the focus.
6. Only questions at the level appropriate to the employee's position within the organization should be asked.
7. The interviewee ought to be informed before interview that a system investigation is taking place and its purpose explained.
8. The interview should not be too formal, but should be allowed to develop into a conversation.
9. The interviewer must not jump into conclusion or confuse opinions with facts.
10. The interview should be long enough to obtain the required information.
11. The interviewer should part pleasantly.
12. Interviewer should not discuss the merit, or weakness of other personnel in the organization.

Problems with Interview Method of fact finding

1. The interviewee may refuse to cooperate with the interviewer for fear of loss of job, redundancy, or the inability to cope with the new technology as a result of computerization. This may be in form of direct refusal to take part, being vague in replies, omissions, or continuing to let the interviewer believe what the interviewee knows to be false.
2. Interviewing is an acquired skill and depends on the cooperation of those being interviewed. It can be costly in time and effort; and the results are unpredictable.
3. It consumes the interviewer's time.

Questionnaire: Questionnaires are written lists of questions given to people (employees, management, clients etc.) to respond to. These can be used by a system analyst in an interview, or given to respondents, who will be asked to write answers in their own time and return the completed questionnaire.

Rules for Designing Fact Finding Questionnaires

1. They should not contain too many questions.

2. They should be organized in a logical sequence.
3. They should include occasional questions the answer to which corroborates the answer to previous question.
4. They should be designed so that most questions can be answered by "Yes", "No" or a tick.
5. They should be tested independently before being issued to the actual individuals.
6. The sensitivity of individual job security should be taken into consideration.

Record Inspections/Reviews: Basic records like the reports, bills, policy manuals, regulations, standard operation procedures etc can be used for better understanding the system.

Observation: This is a skill which the analysts have to develop. The analysts have to identify the right information and choose the right person and look at the right place to achieve his objective. He should have a clear vision of how each departments work and work flow between them and for this he should be a good observer.

7.2.2. Establishing System Objectives, Information Requirements & Solution Alternatives

Here the objective of the proposed system is defined and detailed

description of the functions that the new system must perform is developed. Sound requirement specification is also performed here.

The requirements definition can be divided into two – functional requirements and non-functional requirements.

7.2.2.1. Functional Requirements entail

1. user interface (automatic entry of product data and user-friendly data entry screens for customers);
2. processing requirements (fast, automatic calculation of sales totals and delivery costs);
3. storage requirements (fast retrieval and update of data from product, pricing and customer databases); and
4. Control requirements (signals for data entry errors and quick confirmation for customers).

7.2.2.2. Nonfunctional requirements

Nonfunctional requirements address issues associated with effectiveness, efficiency, confidentiality, integrity, availability, compliance and reliability.

7.2.3. Selecting the Package

Applications software packages must be thoroughly evaluated before they can be used as the foundation of a new information system. The most important evaluation criteria are

the functions provided by the package, flexibility, user-friendliness, hardware compatibility, vendor quality and cost.

The system analysis stage must be concluded with a system requirements report.

Chapter 8
System Design

8.1. Description of System Design

It has been established that system analysis describes what a system should do to meet information requirements. System design stage specifies how the system will meet the information requirements as determined by the system analysis; this could be achieve either by conceiving new system or amending existing system to ensure the system objectives are met. The design of an information system is a blueprint or model for that system and consists of all specifications that give the system its form and structure.

8.2. Objectives of System Design

1. To provide a system that meets users' requirements.
2. To design a system within the funds available to the organization.
3. To design a system that is simple in operation.
4. To design a system that processes data accurately.
5. To design a system that flexible for maintenance, and provides for future expansion.

8.3. System Design Activities

1. Logical design of a system is the design of the system in concept. It lays out the components of the system and their relationship to one another as they would appear to users. It shows what the system solution will do as opposed to how it is actually implemented physically. It describes input, output, processing functions to be performed, business procedures to be performed as well as data models and control.
2. Physical design is the process of translating the abstract logical design (model) into a functioning system of people and machines. It produces the actual specifications for hardware, software and physical database as well as input/output media, manual procedures and specific controls. Detailed physical specifications need to be made so that the system can be purchased/built and install.
3. Translating Design Specification into program Codes: this involve coding of the system using computer programming languages of your choice. E.g Qbasic, Java, Visual Basic etc.

8.4. Advantages of Systems Specification

1. System specifications progresses into implementation;
2. It provides source documentation from which programs are written and hardware tenders are prepared;

3. It provides a point of reference used in the assessment of the system once the system is being used.
4. Essential content of a Systems specification
5. Introduction – system summary, objectives and benefits, hardware and software requirements
6. System definition – narrative description in non-technical language, system flowchart
7. Input specification – input media, input control, data capture procedures
8. File specification – summary of file description, record layout, file processing, file controls
9. Output specification – summary of output description and layout, report handling and distribution procedures, output controls
10. Program specification/description - the main tasks to be performed by the programs, computation logic, special formula, test data
11. Implementation procedure – preparation of job procedures for computer and user requirements, file creation, changeover procedures
12. Timetable – user department instructions, clerical procedures
13. Appendices – definition of terms, record reference codes.

Chapter 9
Systems Implementation & Documentation

9.1. Description of System Implementation

The implementation stage consists of the final steps to put the new or modified system into operation. The system is tested to make sure it performs properly from both technical and functional business standpoint before it is commissioned for use. It is the stage where the theoretical design becomes a working practical system.

9.2. Activities in System Implementation

Activities involved in System Implementation include:

i. Acquisition and development of hardware, software and services
ii. End-user training
iii. Testing
iv. System documentation
v. File conversion
vi. System changeover

9.2.1. Acquisition and Development of Hardware, Software and Services

There are many procedures to be followed in other to make better choice for Hardware, Software and Services.

The following factors should be considered in the choice of computer hardware:

1. The ease with which the computer configuration fits in with the user's requirements (e.g. direct access facilities, hard copy output in required quantity).
2. Processing speed and storage size must be sufficient for current and foreseeable requirements, i.e. it should be expandable.
3. Reliability – the hardware should be durable and have low breakdown rate. There should also be back-up facilities to minimise disruptions when the system is down.
4. Simplicity – anybody should be able to easily learn and use it.
5. Ease of communication between hardware and the user.
6. Scalability – the hardware should be able to meet new requirements as they emerge.
7. Security – the hardware should have facilities to keep unauthorized users away from suing it.
8. Cost – the cost should be reasonable vis-à-vis derivable benefits.

9. Networking capacity – should have features to support networking.
10. Mode of processing – batch, online, offline, or multiprocessing etc.
11. Compatibility with peripheral devices.
12. Number of users to be supported.
13. Features to improve use of memory.

The following factors should be considered in the choice of computer software:

1. Compatibility with user's requirements – e.g. report generation, volume of data, data validation etc.
2. User-friendliness – availability of graphical user interface, menu, on-screen prompts and help facilities.
3. Ability of the supplier/vendor to demonstrate the software package.
4. Adequate security control features such as password, data validation checks, accounting controls and reconciliation, audit trails etc.
5. Provision for updating/modifying the software.
6. Compatibility with existing hardware system.
7. Add-on facility – e.g. report generation facilities.
8. Fast processing and response time.
9. Clear and detailed documentation.

10. Survey of other users of the package and how long it has been in the market.
11. Support and maintenance service to be provided by the supplier.
12. Cost effectiveness.
13. Technology version.

9.2.2. End-user Training

The essence of training is to familiarize the users with the skills necessary to operate the information system to perform specific tasks. The training must be designed to meet specific needs of every level of staff; for instance, senior management staff would be interested in the overall capabilities and limitations of the system, while junior staff needs to be taught the functional aspects that relate their respective functional department.

9.2.3. Testing and installation

9.2.3.1. Description of System Testing and installation

The system must be tested before it can be confirmed ready for operation. System testing is an exhaustive and thorough process of examining the system to determine whether the system produces the desired results under known conditions.

The system components are tested under specified conditions and the results are observed, recorded and evaluated.

Testing examines the system in order to ensure that all that needs to be built into it had been done to specification by assessing how it performs in a 'live' environment.

In order to do this effectively, test data must be carefully prepared, results reviewed and corrections made, if necessary. The development team works with the users to develop a systematic test plan. Testing an information system is of two types as discussed below.

Systems Testing and **User Acceptance Testing**

System Testing: A system testing is usually carried out by the development team to ensure the technical completeness and functionality of the system. It tries to determine if discrete modules will function together as planned and whether discrepancies exist between the way the system actually works and the way it was conceived. **User Acceptance Testing:** User acceptance testing follows a successful systems testing. At this stage, users or their representatives are asked to formally check whether the system fulfill its requirements. User acceptance testing considers the functional characteristics of the system but is likely to repeat the detailed range and format checks undertaken in systems testing. Deviations between the system operations and users' actual requirements become apparent at this stage. This stage provides the final certification that the system is ready to be used in the business operations. Systems are evaluated by users

and reviewed by the management. When all parties are satisfied that the new system meets their standard specifications, the system is formally accepted for installation.

9.2.4. System Documentation

9.2.4.1. Description of System Documentation

System documentation refers to descriptions of how an information system works from both a technical and end-user's standpoint. It is a collection of documents that describes the system, its components, the data, and records of changes made to the system. They are aids provided for understanding the structure and intended uses of an information system or its components such as flowcharts, textual material, and user manuals. Comprehensive documentation will include the requirements, capabilities and limitations, design, operation and maintenance guides for the system. The word documentation refers to a wide range of reference materials used in the running and maintenance of computer systems. Documentation includes a wide range of technical and non-technical books, manuals, descriptions and diagrams relating to the use and operations of a computer system. Details of all changes to the system must be recorded and documented to the same standard as the original. Copies of all documentation must be updated when changes are made.

9.2.4.2. Objectives of Good System Documentation

1. To enable analysts, programmers, users and computer operators to communicate.
2. To facilitate revision or modification of systems.
3. For use in training of system operation staff.
4. To assist in the detection and correction of errors in the system.
5. To ensure consistent application of system throughout the organization.
6. To assist the auditors in the computer audit process.
7. Types of documentation
8. The first category of documentation that must be kept is that which was used in the initial system development process. These are feasibility study report, system requirements, system specifications, program specifications, as well as test data and security precautions.
9. The second category of documentation is that aimed at helping the users. It includes user manuals, help screens, handy reference cards, and various other references designed to make life easier for the users.

Note: System documentation and program documentation are directly related and some types of this documentation were discussed in chapter 3 section 3.7.

9.2.5. File conversion

9.2.5.1. Description of file conversion

File conversion is the process of moving data from files in the existing system into files in the new system. These files could contain different information, and may be in a different format. File conversion may be from a manual system to a computer system or from an existing computer system to a new computer system. This is a major part of system implementation and must be fully controlled to ensure that errors are not allowed to creep into the new files. It is the user department that carries the major workload here.

9.2.5.2. Stages involve in file conversion from Manual to Computer

The stages in file conversion from manual files to computer files are:

1. Ensuring that the original record files are accurate and up-to-date.
2. Recording the old file data on specially designed input documents will usually be done by the user department personnel following detailed instructions laid down by the system designer or software supplier. These instructions will include the procedures for allocating new code numbers and for checking the accuracy and completeness of the data selected and entered in the input documents.

3. Transcribing the completed input documents on to the new system may be done by the user department staff keying in the data from the terminals.
4. Using special programs to read the transcribed data and produce the required files in the appropriate form would include validation checks on the input data. The content of the files must then be printed out and completely checked back to the data input forms (or even the original file if possible).
5. Correcting any errors that this checking reveals.

9.2.6. System Changeover

9.2.6.1. Description of System change overs

System change over involve all form of activities, techniques or methodology require to change from current system to the newly created or modified system.

9.2.6.2. Types of Changeover Techniques

There are four basic changeover techniques or methodology, these are: Direct changeover, Parallel changeover, Pilot changeover, and Phased changeover. Each of the techniques is discussed as follows.

Direct changeover: This is the technique where the old system is discarded and replaced by the new system in one move. In a twinkling of an eye, all the new procedures, programs, data files,

and inputs are made operational. Experience has shown that direct changeover is a popular in real life applications; however, certain conditions/factors may favor its adoption.

Factors Favoring Direct Changeover

1. The old and new systems are significantly different and a complete change is the only practical way out.
2. The old system is so ill-structured that it is management decision to discontinue using it immediately.
3. Some modules in the existing system are partially computerized while the new system is an integrated package.
4. The old system is a small size system with low volume of data to be converted.
5. An exceptionally qualified team is available to carry out conversion and implementation flawlessly.
6. The new system is an integrated one that cannot be effectively implemented in phases.
7. There is a dependable fallback arrangement or workable alternative in the event of failure.
8. It is difficult to handle transactions in parallel.
9. There are demands from user organization/department for immediate availability of the new system.

Advantages of Direct Changeover

1. It makes the new system immediately available and can be utilized.
2. It saves cost in the long run, provided no major problem arises.
3. It is relatively cost-effective as resources are utilized on the new system while the old system is discontinued.

Disadvantages of Direct Changeover

1. It may disturb stability and order in the organization when users are learning and adapting to the new system.
2. The downside risk is high, as in the event of failure, the whole process must be repeated with double disruptions of going back to the old system and changing again to the new later.
3. It requires a very brief period for transition, which may stretch the organization beyond its capacity, thereby negatively impacting on the efficiency of the business operations.

Parallel changeover: In parallel approach, the old and the new systems are operated simultaneously for a period of time, crosschecking the results from the new system with the old, to make sure that the new system meets the requirements that the

old system has been meeting all along. It is therefore a safe, cautious and less risky approach. This approach is particularly appropriate for systems that produce routine output that users expect regularly. Anew payroll, for instance, may be implemented in a parallel fashion. The output of the new and the old versions may be compared to make sure that the new system is producing the require output.

Advantages of Parallel Changeover

1. It creates opportunity to detect the hidden defects and problems of the new system, to correct them and bring the system to efficient standard expected of the system.
2. A system that has been fully checked, corrected and perfected under actual operating conditions will be implemented.
3. Failure of the new system will have little/no impact on the business operation, as normal operations can continue on the old system.
4. It gives the user personnel enough time to get familiar with the new system.
5. The outputs of both old and new systems are available for comparison and evaluation.

Disadvantages of Parallel Changeover

1. The simultaneous running of the old and new system amounts to duplication of operation.
2. The duplication of operation/processing will result in very high direct costs.
3. The new and old organizational structure may be incompatible, thus foreclosing parallel approach as feasible.
4. The volume of work may be too large to be handled for two systems.
5. The need for more staff and resources to cope with the two systems concurrently makes parallel approach very expensive.
6. The duration of parallel run can vary considerably between systems, from two weeks to six months.

Phased Changeover: Phased changeover is a form of parallel approach where the new system is implemented bit-by-bit i.e. in a piecemeal fashion. In the phased approach, a module (i.e. complete logical part of the whole system) is implemented as a unit in the new system. If the output of the piecemeal run is satisfactory, confidence is established and full scale conversion of the remaining parts will follow. Phased changeover has similar advantages and disadvantages as the parallel method

Pilot changeover: Pilot approach implements the new system at different departments/divisions of the organization at different times. Here the changeover is carried out at different times in different places, so that while new system implementation is on at one branch, the business operations of other branches are done with the old system. This approach works best where the organization has geographically dispersed units/branches/division. This approach is likely to be the only option for a large conglomerate with various subsidiaries and branches, particularly where the subsidiaries and branches are engaged in different activities or are subject to different regulations, statutory requirements, operating environments and seasonal fluctuations.

Factors favoring Pilot Changeover

1. Control is the critical factor, because implementation is carried out in dispersed locations at different times. Control measures must be in place to make sure that the overall system remains totally synchronous. This approach has the potential of producing the best results as implementation can be improving progressively, if properly controlled and coordinated. However, failure can be costly and a poorly integrated system may result.

2. Where the system can be readily segmented into different phases, subsystems or geographical zones.
3. Where there are high demands on system reliability.
4. Where the new system is a highly complex one that is difficult to implement at once or as a unit.
5. Advantages of Pilot Changeover
6. The output of the implemented subsystems, phases and geographical zones are available for use while the implementation of the full system is ongoing.
7. The risk of failure of a subsystem or phase is low and recovery does not affect the whole system.
8. User experience with a well-designed and proven subsystem, phase or geographical zone will make the acceptance of the remaining parts of the system easier.
9. Disadvantages of Pilot Changeover
10. The organization of the user departments and/or the nature of the system may not permit the division of the system into parts and implemented as such.
11. It is time-consuming.
12. Failure can be costly and a poorly integrated system may result, if the whole process is not well controlled and coordinated.

Chapter 10
Systems Maintenance/Evaluation

10.1. Description of Maintenance and Evaluation

System evaluation is the process of assessing the strength and weakness of any system. System evaluation is a formal review process conducted after a system has been put into operation to determine how well it has met its original objectives, that users accept it and that its performance is satisfactory. System evaluation should establish whether the objectives and targeted performance criteria have been met, and if not, why not, and what should be done about it.

Systems maintenance is used to describe the process of modifying a system after it has been implemented and is in use, to correct errors and provide new facilities. It is important for systems designers to build in mechanism that identify when maintenance is needed, and to start the process of updating the system.

10.2. Types of System Maintenance

There are different categories of system maintenance; some of these maintenance techniques are discussed below.

1. Corrective Maintenance

   It consists of actions in response to a problem or system failure. It is carried out to correct faults in hardware and software.

2. Perfective Maintenance

   It is a form of maintenance carried out to improve the performance, maintainability, overall effectiveness or other attitudes of a system. It may be prompted by the availability of new techniques, or by request for enhancement from the users. e.g. the increase in volume of data storage, the replacement of Word2007 for Word2010 etc.

3. Adaptive Maintenance

   This is type of maintenance carried out to take account of anticipated changes in the processing environment; e.g. new taxation legislation might require change to be made in payroll software.

4. Preventive Maintenance

   This is a maintenance been carried out in advance of a problem occurring. Preventive maintenance is like having a car serviced regularly in order to reduce risk of breakdown.

More preventive maintenance means less corrective maintenance. Examples of preventive maintenance include: covering the computer hardware with dust cover to prevent dust, controlling the use of computer resources so that malicious unauthorized users do not have access to them, making back-up of data and programs.

10.3. Relationship Between System Operation, Maintenances & Cost

The system designer must not only design a system that serve the need of the organization but must also aim at reduce the cost of maintenances and operation. For that to be achieved the following factors must be met:

1. The system must be easily modified when the need arise
2. The system must not be too complex

In other to meet the 2 factors above the following conditions must be met during the process of system analysis, design and implementation.

1. The system underline software must be user friendly, menu driven, interacting and intelligent.
2. The user department must be actively involved in system development and implementation.
3. The system must be properly documented and modular in nature.

4. System must have validation check at the various stages of the development and implementation.
5. Users department must be adequately trained on the need for the information system and its objectives.

Chapter 11
Process of Backing up Computer

11.1. Description of Computer Backup

In information Technology, a backup, or the process of backing up, refers to the copying and archiving of computer data so it may be used to *restore* the original after a data loss event. Backups popularly represent a simple form of disaster recovery, and should be part of a disaster recovery plan, by themselves; backups should not alone be considered disaster recovery. One reason for this is that not all backup systems or backup applications are able to reconstitute a computer system or other complex configurations such as a computer cluster, active directory servers, or a database server, by restoring only data from a backup

11.2. Purposes of Backups

Backups have two distinct purposes as discussed below.

1. The primary purpose is to recover data after its loss, be it by data deletion or corruption. Data loss can be a common experience of computer users.

2. The secondary purpose of backups is to recover data from an earlier time, according to a user-defined data retention policy, typically configured within a backup application for how long copies of data are required.

11.3. Data Repository Models

Backup strategy starts with a concept of a data repository. The backup data needs to be stored somehow and probably should be organized to a degree. It can be as simple as a sheet of paper with a list of all backup tapes and the dates they were written or a more sophisticated setup with a computerized index, catalog, or relational database. Data repository could be any of the following.

11.3.1. Unstructured

An unstructured repository may simply be a stack of floppy disks or CD-R/DVD-R media with minimal information about what was backed up and when. This is the easiest to implement, but probably the least likely to achieve a high level of recoverability.

11.3.2. Full only / System imaging

A repository of this type contains complete system images from one or more specific points in time. This technology is frequently used by computer technicians to record known good

configurations. Imaging is generally more useful for deploying a standard configuration to many systems rather than as a tool for making ongoing backups of diverse systems.

11.3.3. Incremental

An incremental style repository aims to make it more feasible to store backups from more points in time by organizing the data into increments of change between points in time. This eliminates the need to store duplicate copies of unchanged data, as would be the case with a portion of the data of subsequent full backups. Typically, a *full* backup (of all files) is made which serves as the reference point for an incremental backup set. After that, any number of *incremental* backups is made. Restoring the whole system to a certain point in time would require locating the last full backup taken previous to the data loss plus each and all of the incremental backups that cover the period of time between the full backup and the point in time to which the system is supposed to be restored.

11.3.4. Differential

A differential style repository saves the data since the last full backup. It has the advantage that only a maximum of two

data sets are needed to restore the data. One disadvantage, at least as compared to the incremental backup method, is that as time from the last full backup (and, thus, data changes) increase so does the time to perform the differential backup. To perform a differential backup, it is first necessary to perform a *full* backup. After that, each differential backup made will contain all the changes since the last full backup. Restoring an entire system to a certain point in time would require locating the last full backup taken previous to the point of the failure or loss plus the last differential backup since the last full backup.

11.3.5. Reverse delta

A reverse delta type repository stores a recent "mirror" of the source data and a series of differences between the mirror in its current state and its previous states. A reverse delta backup will start with a normal full backup. After the full backup is performed, the system will periodically synchronize the full backup with the live copy, while storing the data necessary to reconstruct older versions.

11.4. Storage Media

Regardless of the repository model that is used, the data has to be stored on some data storage medium somewhere. Some of the data storage media are discussed as follows.

11.4.1. Magnetic Tape

Magnetic tape has long been the most commonly used medium for bulk data storage, backup, archiving, and interchange. Tape has typically had an order of magnitude better capacity/price ratio when compared to hard disk, but recently the ratios for tape and hard disk have become a lot closer.[6] There are myriad formats, many of which are proprietary or specific to certain markets like mainframes or a particular brand of personal computer. Tape is a sequential access medium, so even though access times may be poor, the rate of continuously writing or reading data can actually be very fast. Some new tape drives are even faster than modern hard disks. A principal advantage of tape is that it has been used for this purpose for decades (much longer than any alternative) and its characteristics are well understood.

11.4.2. Hard Disk

The capacity/price ratio of hard disk has been rapidly improving for many years. This is making it more competitive with magnetic

tape as a bulk storage medium. The main advantages of hard disk storage are low access times, availability, capacity and ease of use. External disks can be connected via local interfaces like SCSI, USB, FireWire, or eSATA, or via longer distance technologies like Ethernet, iSCSI, or Fibre Channel. The main disadvantages of hard disk backups are that they are easily damaged, especially while being transported (e.g., for off-site backups), and that their stability over periods of years is a relative unknown.

11.4.3. Optical Storage

Recordable CDs, DVDs, and Blu-ray Discs are commonly used with personal computers and generally have low media unit costs. However, the capacities and speeds of these and other optical discs are typically an order of magnitude lower than hard disk or tape. Many optical disk formats are WORM type, which makes them useful for archival purposes since the data cannot be changed. The use of an auto-changer or jukebox can make optical discs a feasible option for larger-scale backup systems. Some optical storage systems allow for cataloged data backups without human contact with the discs, allowing for longer data integrity.

11.4.4. Floppy Disk

During the 1980s and early 1990s, many personal/home computer users associated backing up mostly with copying to floppy disks. However, the data capacity of floppy disks failed to catch up with growing demands, rendering them unpopular and obsolete.

11.4.5. Solid State Storage

This is also known as flash memory, thumb drives, USB flash drives, CompactFlash, SmartMedia, Memory Stick, Secure Digital cards, etc., these devices are relatively expensive for their low capacity. A solid state drive does not contain any movable parts unlike its magnetic drive counterpart and can have huge throughput in the order of 500Mbit/s to 6Gbit/s. SSD drives are now available in the order of 500GB to TBs.

11.4.6. Remote Backup Service

Due to widespread of broadband internet access the remote backup services are gaining popularity. Backing up via the internet to a remote location can protect against some worst-case scenarios such as fires, floods, or earthquakes which would destroy any backups in the immediate vicinity along with

everything else. There are, however, a number of drawbacks to remote backup services. First, Internet connections are usually slower than local data storage devices. Residential broadband is especially problematic as routine backups must use an upstream link that's usually much slower than the downstream link used only occasionally to retrieve a file from backup. This tends to limit the use of such services to relatively small amounts of high value data. Secondly, users must trust a third party service provider to maintain the privacy and integrity of their data, although confidentiality can be assured by encrypting the data before transmission to the backup service with an encryption key known only to the user. Ultimately the backup service must itself use one of the above methods so this could be seen as a more complex way of doing traditional backups.

Chapter 12
Computer and Internet

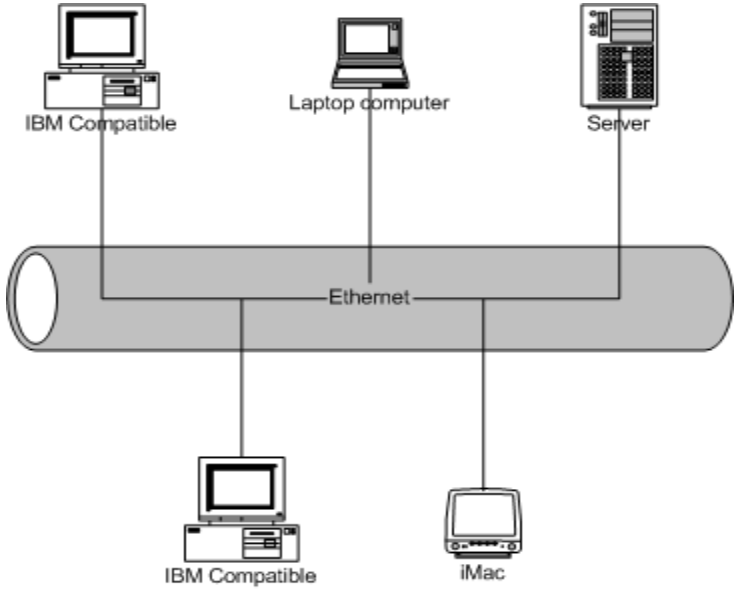
12.1. Description of Internet

The Internet is a global system of interconnected governmental, academic, corporate, public, and private computer networks. It is based on the networking technologies of the Internet Protocol Suite. It is the successor of the Advanced Research Projects Agency Network (ARPANET) developed by DARPA of the U.S. Department of Defense. The 'Internet' is most commonly spelled with a capital 'I' as a proper noun, for historical reasons and to distinguish it from other generic internetworks. Participants in the Internet use a diverse array of methods of several hundred documented, and often standardized, protocols compatible with the Internet Protocol Suite and an addressing system (IP Addresses) administered by the Internet Assigned Numbers Authority and address registries. Service providers and large enterprises exchange information about the reachability of their address spaces through the Border Gateway Protocol (BGP), forming a redundant worldwide mesh of transmission paths.

12.2. Computer Networks and it Classification

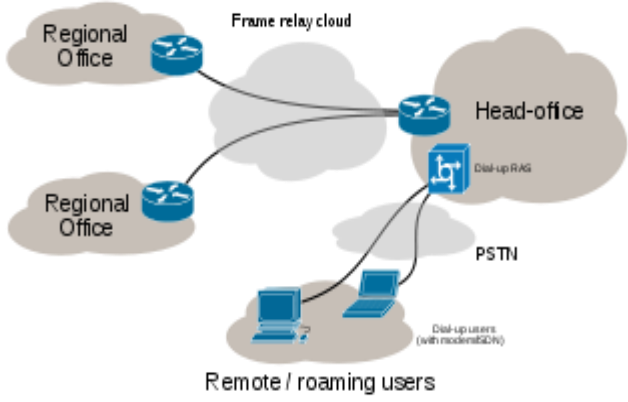
12.2.1. Local Area Network (LAN)

A local area network (LAN) is a computer network that interconnects computers in a limited area such as a home, school, computer laboratory, or office building using network media. The defining characteristics of LANs, in contrast to wide area networks (WANs), include their usually higher data-transfer rates, smaller geographic area, and lack of a need for leased telecommunication lines. ARCNET, Token Ring and other technology standards have been used in the past, but Ethernet over twisted pair cabling, and Wi-Fi are the two most common technologies currently used to build LANs. The diagram below illustrates local area network.



12.2.2. Metropolitan Area Network (MAN)

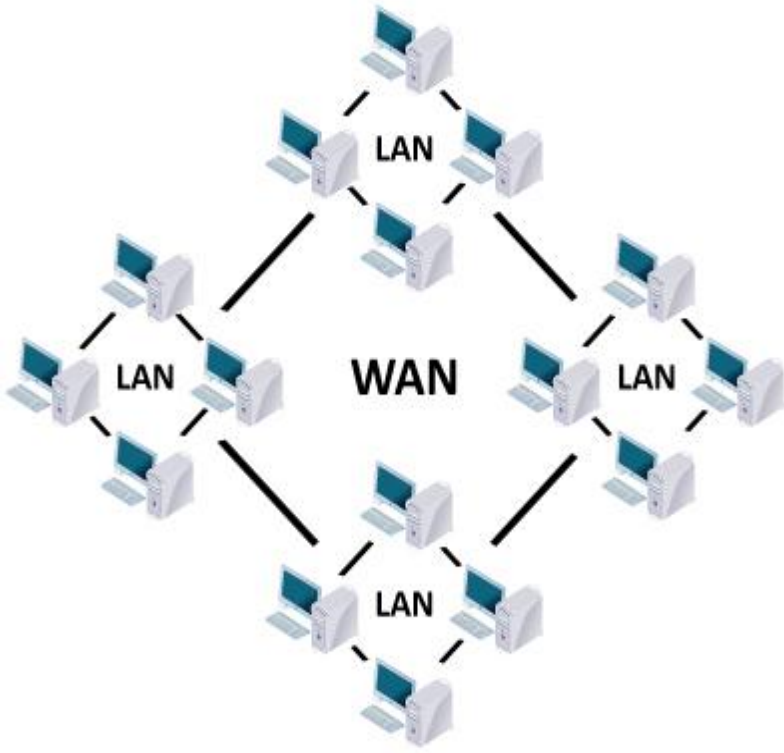
A metropolitan area network (MAN) is a computer network that usually spans a city or a large campus. A MAN usually interconnects a number of local area networks (LANs) using a high-capacity backbone technology, such as fiber-optical links, and provides up-link services to wide area networks (or WAN) and the Internet. A Metropolitan Area Network (MAN) is a large computer network that spans a metropolitan area or campus. Its geographic scope falls between a WAN and LAN. MANs provide Internet connectivity for LANs in a metropolitan region, and connect them to wider area networks like the Internet.



12.2.3. Wide Area Network

A Wide Area Network (WAN) is a network that covers a broad area (i.e., any telecommunications network that links across

metropolitan, regional, or national boundaries) using private or public network transports. Business and government entities utilize WANs to relay data among employees, clients, buyers, and suppliers from various geographical locations. In essence, this mode of telecommunication allows a business to effectively carry out its daily function regardless of location. The Internet can be considered a WAN as well, and is used by businesses, governments, organizations, and individuals for almost any purpose imaginable.



12.3. Services Available on Internet

There are different types of services available on internet; some of them are discussed below.

12.3.1. Information Browsing

This enables end-users, working from personal computers (PCs), to search and find information of interest. The user is aided by special software and data stored in readily usable formats. A World Wide Web (WWW) browser program enables the user to search for data either by name or by specifying a known location. Examples of popular web browser programs that can run on PCs are Netscape and Goggle.

12.3.2. Electronic mail

Electronic mail (E-mail) is often used to send messages between people working over a LAN or WAN. When the e-mail is sent, it is stored somewhere on another computer, for example, on the file server of a LAN. The e-mail message must include a subject (which gives a brief of what the message is about) and the e-mail address of the person or people to whom it is sent.

12.3.3. Newsgroups

The Usenet facility on the Internet enables users to gain access to a very wide range of information topics. The Usenet software receives "postings" of information and transmits new postings to

users who have registered their interest in receiving the information.

12.3.4. File Transfer

If computers are on the same network, a file stored on the hard disk of one computer can be copied into another computer by the use of file transfer. On the Internet this is called file transfer protocol (ftp). The process of file transfer is usually referred to as downloading files to your system and uploading files from your system to a remote site.

12.3.5. Access and use of other Computers

The Telnet facility on the Internet enables a user on one computer to become a user on another computer across the network.

12.4. Domain Names

The Domain Name System (DNS) is a hierarchical distributed naming system for computers, services, or any resource connected to the Internet or a private network. It associates various information with domain names assigned to each of the participating entities. Most prominently, it translates domain names meaningful for users to the numerical IP addresses needed for the purpose of locating computer services and devices worldwide. By providing a worldwide, distributed keyword-based redirection service, the Domain Name System is an essential

component of the functionality of the Internet. The domain name system defines the address of each computer on the Internet. A domain name is used to register a presence on the Internet. It is made up of many different parts with each level of the address nesting inside the previous level.

An often-used analogy to explain the Domain Name System is that it serves as the phone book for the Internet by translating human-friendly computer hostnames into IP addresses. For example, the domain name www.example.com translates to the addresses 192.0.43.10 (IPv4) and 2001:500:88:200::10 (IPv6). Unlike a phone book, the DNS can be quickly updated, allowing a service's location on the network to change without affecting the end users, who continue to use the same host name. Users take advantage of this when they recite meaningful Uniform Resource Locators (URLs) and e-mail addresses without having to know how the computer actually locates the services.

A typical e-mail address is made up as follows:

For example, the E-mail address: **engryekini @ yabatech.edu.ng** breaks down as follows:

engryekini	- the individual computer user's name
yabatech	- the domain name of the host computer
edu	- signifies a educational organisation
ng	- the country code

12.5. Internet Service Providers

Internet Service Providers (ISP) is the organisation that provides connectivity to the Internet. They are in two categories, Internet-only providers and private data networks. An Internet service provider (ISP) provides access to the Internet. ISPs employ a range of technologies to enable consumers to connect to their network.

Few users and small businesses, traditional options include: dial-up, DSL (typically Asymmetric Digital Subscriber Line, ADSL), broadband wireless, cable modem, fiber to the premises (FTTH), and Integrated Services Digital Network (ISDN) (typically basic rate interface). While for customers with more demanding requirements, such as medium-to-large businesses, or other ISPs, DSL (often Single-Pair High-speed Digital Subscriber Line or ADSL), Ethernet, Metropolitan Ethernet, Gigabit Ethernet, Frame Relay, ISDN (B.R.I. or P.R.I.), ATM (Asynchronous Transfer Mode) and upload satellite Internet access. Sync-optical cabling (SONET) is more likely to be used.

12.6. Internet Connection/Access

A connection/access to the Internet can be made in one of the following ways:

1. Using the local area network (LAN) that is already connected to the Internet at an office.

2. On a computer that is already connected at an academic institution.
3. Paying for an account with an Internet service provider (ISP) company. The user will need a personal computer, a modem, a telephone line, and suitable software. ISPs directly connect clients to the Internet using copper wires, wireless or fiber-optic connections.

Chapter 13
Decisions Making In an Organization

13.1. Description of Decision-Making

Decision-making is the process of developing a commitment to some course of actions. Another way to understand decision-making is to view it as a process of problem solving. A problem exists when there is a perceived gap between an existing and desired state. As a sales manager, you might see your quarterly sales fall short of the department quota (existing state). You would like to make a decision that ensures that your department meets the quota for the next quarter (desired state), which might require making choices about resource allocation (hiring personnel, increased marketing activity, training, etc.)

13.2. Decision-Making Environments

There are a number of different decision environments that we are facing within an organisation. Typically, we make decisions in organisations that fall under one of three different categories:

13.2.1. Certainty Environment

This is an environment where we can depend on the outcome, because we have all of the information we need. For example, you have talked to three people in the organisation that you have considered for a job, and you must nominate one person. They are equally qualified, but only one of them is interested in the job – so it is with high certainty that you recommend this person, knowing the likely outcome.

13.2.2. Risk Environment

In an environment of risk, you still have information, just not as much. Yet you have enough information to assign a probability to the outcome – in other words, you can determine the degree of likelihood of the outcome. So for example, you have recent financial statements for the last three years, up to and including last months, that show a gross margin on your revenues of between 30 and 32 percent. You can predict with a high probability in your projections that it will remain as such, if all else remains constant in terms of influencing variables.

13.2.3. Uncertain Environments

These are the most difficult. Under these circumstances, you have very little information, and prediction is virtually impossible. You are not able to rely on any data you have in a meaningful way, and therefore sometimes these decisions are made using your

own intuition, your employees understanding and analysis of the possible outcomes. Perhaps you are trying to determine whether to launch a new product. It is a product that has no similar competitor, and it is expensive to produce. You think, based on the limited market research you have conducted, that it stands a good chance, but it's really your gut that's telling you that. One environment that the literature discusses is 'organised anarchy',

13.3. Types of Decision

Given the various decision environments within which we make decision, there are three primary types of decisions that we are able to make:

13.3.1. Programmed Decisions

Programmed decisions are made for very routine problems. Let's assume you supervise an assembly line at GM and an employee calls in sick. You have likely made the decision of how to replace his/her position many times before and therefore do not have to give it a lot of thought.

13.3.2. Nonprogrammed Decisions

These are the type of decisions that you have not typically made in the past. You need to demonstrate some creativity in your data gathering in order to make the most logical, effective decision you can. Often nonprogrammed decisions are decisions made at a

middle or upper management level. For example, you might be running a division that is growing very quickly, and you need to implement more professionalised, standardised policies and procedures.

13.3.3. Associative choices

Associative choices are slightly different than decisions, in that the outcome of associative choices is not ideal. Associative choices are made in 'organised anarchy' environments, where the pace of change has been rapid. The intention is not to solve the problem, because circumstances do not allow for that. Rather, associative choices are made to improve the work environment; the problems are not solved.

Note: Apart from the 3 major decision making types discussed, the following could be classified as decision making types also.

13.3.4. Rational Decision-Making

In theory, we should always make decisions that are rational. There are a number of considerations and actions that facilitate rational decision-making, yet in reality not all of our decisions are purely rational. It entails a sequential progression through seven steps:

1. Identify the problem.

2. Establish decision criteria, and allocate weights to the criteria.
3. Search for relevant information.
4. Develop alternative solutions to the problem.
5. Evaluate alternative solutions.
6. Choose the best solution.
7. Implement and monitor chosen solution.

13.3.5. Individual vs Group Decision

Many organisations employ groups to make decision rather individuals. There are a number of strengths and weaknesses to group decision-making, compare to individual decision as discussed below.

Strengths of Group Decision-Making: Some of the strength of group decision making are: Decision quality is higher in groups, because of the following.

The group as a whole can generate more complete information and knowledge.

In addition, groups tend to generate more ideas than individuals, and they can evaluate ideas better than individuals. Groups offer a greater diversity of views than individuals because of the heterogeneous nature of the group.

There is also generally an increased acceptance of and commitment to the decision, partly because of the diffusion of responsibility across the members of the group.

With particular reference to the above listed points, we conclude that the groups actually do make higher-quality decisions than individuals do? The answer to that question is yes. And that happen when and where:

i. The group members differ in skills and abilities
ii. Division of labor can occur
iii. The group members have a memory for facts
iv. Individual judgments can be combined by weighting them to reflect the expertise of the various members.

Weaknesses of Group Decision-Making

While there are a number of advantages to using groups to make decisions in organisations, there are a number of shortcomings:

- Group decisions are usually more time consuming.
- The decisions necessitate much discussion and debate, and this tends to increase with group size.
- Group conflict is difficult to avoid, and it may affect the decision making.
- Domination of the group and its processes is often a problem in group's decision. For example one individual or a small coalition may create ineffective decisions, if views are imposed on the group that emerge from misinformation or extreme biases.
- Groupthink is a risk of group decisions. There are a number of steps that can be taken to minimise the risk of

groupthink: leaders must try not to exert undue pressure toward a specific outcome; norms should be established that encourage dissent, and outside experts might be invited occasionally into the group to contribute their own perspective on various problems.

13.4. How To Improve Decision-Making in an Organisation

There are a number of things to consider when making decisions, either individually or as a group. Using creativity in decision-making is something that we need to consider as part of our day-to-day decision-making approaches. This is a very critical part of decision-making, because decisions require creativity now, perhaps more than ever, because of the rapid pace of change within which we must make decisions. Their five stages of creative thinking: a creative decision is defined as one that uses unique and novel responses to problems and opportunities.

i) Preparation: through your day-to-day activities, you must move along a learning curve, and it is at this stage that you develop some sense of the complexities of your environment.

ii) Concentration: at the concentration stage, specific problems are identified, and contextualised as much as possible.

iii) Incubation: this stage is really the meat of the creative component, in that you must approach the problem from as many angles and directions as you can, in order to feel that you have exhausted all possible definitions. This is where brainstorming in a group really adds value.

iv) Illumination: once you have a very specific idea of what the problem is, potential alternatives sometimes almost jump out at you. Other times, they emerge slowly, from further analysis. But in any case, it is at this stage that you really are putting the pieces of the problem/solution mix together.

v) Verification: this is a post-problem solving stage, in that you are following up on your analysis and recommendations, to ensure that they were appropriate and have indeed met planned objectives.

13.5. Decision Table

Decision tables, like flowcharts and if-then-else and switch-case statements, associate conditions with actions to perform, but in many cases do so in a more elegant way. In the 1960s and 1970s a range of "decision table based" languages such as File tab were popular for business programming.

Decision Table Structure

A decision table is typically divided into four quadrants, as shown below.

The four quadrants	
Conditions	Condition alternatives
Actions	Action entries

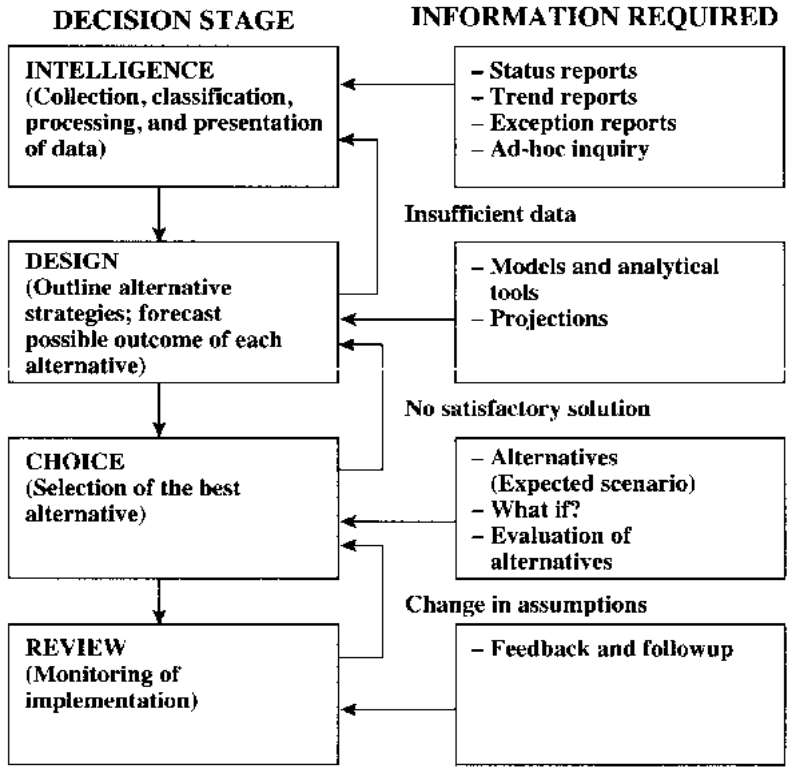
Each decision corresponds to a variable, relation or predicate whose possible values are listed among the condition alternatives. Each action is a procedure or operation to perform, and the entries specify whether (or in what order) the action is to be performed for the set of condition alternatives the entry corresponds to. Many decision tables include in their condition alternatives the don't care symbol, a hyphen. Using don't cares can simplify decision tables, especially when a given condition has little influence on the actions to be performed.

Chapter 14
Information Needed In Management Decision Making

14.1. Relevance of Information in Decision Making Process

Some information analysts see the process of decision making as comprising four steps: **Intelligence, Design, Choice,** & **Review**. The intelligence stage encompasses collection, classification, processing, and presentation of data relating to the organization and its environment. This is necessary to identify situations calling for decision. During the decision stage, the decision maker outlines alternative solutions, each of which involves a set of actions to be taken. The data gathered during the intelligence stage are now used by statistical and other models to forecast possible outcomes for each alternative. Each alternative can also be examined for technological, behavioral, and economic feasibility. In the choice stage, the decision maker must select one of the alternatives that will best contribute to the goals of the organization. Past choices can be subjected to review during implementation and monitoring to enable the manager to learn from mistakes. Information plays an important role in all four stages of the decision process discussed. The diagram below

illustrates further the important of information in decision making.



14.2. Sources of Information for Management Decision

Internal Sources

These are the set of data/information that are generated in the course of business operations of the organization. e.g.

i. Sales invoice/receipts

ii. Marketing

iii. Personnel records
iv. Finances
v. Production records
vi. Asset records
vii. Stock/inventory
viii. Purchases

External Sources

These are data/information that is obtained from the environment surrounding the organization. e.g.

i. Government legislation
ii. Competitors
iii. Public opinions
iv. Textbooks
v. Internet
vi. Mass media
vii. Published articles by regulatory bodies and research institutes e.g. Central Bank of Nigeria, Government ministries and agencies, Federal Office of Statistics etc.

14.3. Data Capture Techniques

Multiple methods are available for capturing data from documents as in; structured documents (questionnaires, tests, insurance forms, tax returns, ballots, etc.) have completely the same structure and appearance. It is the easiest type for data

capture, because every data field is located at the same place for all documents., Semi-structured documents (invoices, purchase orders, waybills, etc.) have the same structure but their appearance depends on number of items and other parameters. Capturing data from these documents is a complex, but solvable task., and Unstructured documents (letters, contracts, articles, etc.) could be flexible with structure and appearance.

The list of methods identified below is not exhaustive but it is a guide of the appropriate usage of each method when addressing business process in any business organization. As well as considering the method of data capture, due consideration of the origins of the documents(s) that need to be captured must happen, to see if the documents are available in their original electronic format which, has the potential to massively increase data capture accuracy and remove the need for printing and scanning. Methods of capture from documents in electronic format are identified below.

Whenever a method of capture is considered, it is advisable in the first instance to consider the original documents, to determine if the document or form can be updated to improve the capture/recognition process and method. Some methods of data capture from documents are discussed below.

14.3.1. Methods of Capturing Data from Non-Digital Document

Manual keying

Manual keying of metadata from unstructured data is appropriate for data that is received in low volumes and results in low levels of recognition by intelligent data capture products (IDR, ICR).

Offshore keying

Offshore keying of Metadata is most appropriate for the following reasons:

- High volumes of individual documents where the level of recognition achieved using intelligent data capture products is low (can include documents with a high level of handwritten data).
- Potentially capturing the data that has not been successfully captured using an Intelligent data capture product.
- High volume of individual documents where the data to be extracted is not consistent from page to page.
- Can be very cost efficient based on the lower labour costs that can be achieved.

Single click

Single click is an Optical Character Recognition (OCR) tool that can be used to capture machine produced characters in low

volume ad-hoc capture applications and populating a line of business application.

OCR (Optical Character Recognition)

OCR as a technology provides the ability to successfully capture machine produced characters in preset zones or, full page. OCR systems can recognize many different OCR fonts, as well as typewriter and computer-printed characters. Dependent upon the capabilities of the particular OCR product, this can be used to capture low to high volumes of data, where the information is in consistent location(s) on the documents.

ICR (Intelligent Character Recognition)

ICR is the computer translation of hand printed and written characters. Data is entered from hand-printed forms through a scanner, and the image of the captured data is then analyzed and translated by sophisticated ICR software. ICR is similar to optical character recognition (OCR) but is a more difficult process since OCR is from printed text, as opposed to handwritten characters.

Bar Code Recognition

Dependent upon the type of barcode that is used, the amount of metadata that can be included is high, as is the level of recognition. The application of single or multiple bar codes to particular document types such as Proof of Delivery notes,

membership forms, application forms, gift aid etc, can dramatically increase the effectiveness of a business process.

Template based intelligent capture

The level of capability is dependent upon the individual template based intelligent capture product. More advanced products are able to identify machine produced and to a lesser degree handwritten characters that are contained in particular area(s) of a document. These applications are used where the number of document types being received are relatively low (typically up to 30 different document types) but consistent. Used in applications such as census, inter-bank transfers application forms.

Intelligent Document Recognition (IDR)

The level of capability is dependent upon the individual product. These applications are used to capture metadata from documents that is rules based. For example, the product will identify post codes, logos, key words, VAT registration numbers and, through an ongoing learning process, capture information from multiple document types. This type of capture is used for high volume invoice processing and digital mailroom applications, where the classification and indexing of incoming documents is key. IDR software applications use rules to identify and capture information from semi-structured documents.

14.3.2. Methods Of Capture Data From Digital Format

Capturing data from source (digital) documents and forms

In our experience, organizations often reduce everything to paper format before going through the process of capturing data. They often do this even when they receive the information in its original digital format. Where this is the case, it is unnecessary, time consuming and costly and often results in a lower level of success in extracting the required data.

Where information is available in its original digital format, tools such as Formate enable organizations to automate the receipt and interrogation of searchable pdf, Word docs, electronic forms, instant messaging, etc, thus capturing the required data digitally and negating the need to print and scan these documents prior to using ICR, OCR, IDR or any of the techniques identified above. As an example, invoices received via email in a searchable pdf format, can potentially have the required data automatically extracted with a high level of accuracy and no human input.

Legacy Data Import

Products such as Alchemy Datagrabber Module, Formate and Onbase allow organisations with legacy systems (mainframe systems) to ingest data for improved search and archival applications.

Examples include cheque requisition reports, property tax reports, invoice and credit note runs. The reports would be parsed

by the application and broken down into individual records or pages. At the same time, index information is extracted from each record or page and associated with that record or page.

Voice Capture

The capture of pure voice records and voice forms is becoming as important for businesses as other forms of communication (email, web forms, fax). Applications such as CallXpress provide the ability to capture voice commands to initiate business processes, store voice records alongside all other forms of communication for future reference in a document management system and convert speech to text.

14.3.3. Automatic Identification and Data Capture

Automatic Identification and Data Capture (AIDC) refers to the methods of automatically identifying objects, collecting data about them, and entering that data directly into computer systems (i.e. without human involvement). Technologies typically considered as part of AIDC include bar codes, Radio Frequency Identification (RFID), biometrics, magnetic stripes, Optical Character Recognition (OCR), smart cards, and voice recognition. AIDC is also commonly referred to as "Automatic Identification," "Auto-ID," and "Automatic Data Capture."

Chapter 15
System

15.1. Description of System

System is a set of interacting or interdependent entities forming an integrated whole. The concept of an '**integrated whole**' can also be stated in terms of a system embodying a set of relationships which are differentiated from relationships of the set to other elements, and from relationships between an element of the set and elements not a part of the relational regime. The term system may also refer to a set of rules that governs behavior or structure.

The scientific research field which is engaged in the study of the general properties of systems includes:

a) Systems theory
b) Cybernetics, dynamical systems
c) Complex systems

They investigate the abstract properties of the matter and organization, searching concepts and principles which are independent of the specific domain, substance, type, or temporal scales of existence.

15.2. Characteristics of System

Most systems share common characteristics, including:

- Systems have structure, defined by parts and their composition;
- Systems have behavior, which involves inputs, processing and outputs of material, energy or information;
- Systems have interconnectivity: the various parts of a system have functional as well as structural relationships between each other.
- Systems have by themselves functions or groups of functions

15.3. Evolution of System

The word system in its meaning here has a long history which can be traced back to Plato (Philebus), Aristotle (Politics) and Euclid (Elements). It had meant "total", "crowd" or "union" in even more ancient times, as it derives from the verb sunìstemi, uniting, putting together.

In the 19th century the first to develop the concept of a "system" in the natural sciences was the French physicist Nicolas Léonard Sadi Carnot who studied thermodynamics. In 1824 he studied what he called the working substance (system), i.e. typically a body of water vapor, in steam engines, in regards to the system's ability to do work when heat is applied to it. The working substance could be put in contact with either a boiler, a cold

reservoir (a stream of cold water), or a piston (to which the working body could do work by pushing on it). In 1850, the German physicist Rudolf Clausius generalized this picture to include the concept of the surroundings and began to use the term "working body" when referring to the system.

One of the pioneers of the general systems theory was the biologist Ludwig von Bertalanffy. In 1945 he introduced models, principles, and laws that apply to generalized systems or their subclasses, irrespective of their particular kind, the nature of their component elements, and the relation or 'forces' between them. Significant development to the concept of a system was done by Norbert Wiener and Ross Ashby who pioneered the use of mathematics to study systems.

In the 1980s the term complex adaptive system was coined at the interdisciplinary Santa Fe Institute by John H. Holland, Murray Gell-Mann and others.

15.4. System Concepts

15.4.1. Environment and boundaries

Systems theory views the world as a complex system of interconnected parts. We scope a system by defining its boundary; this means choosing which entities are inside the system and which are outside – part of the environment. We then make simplified representations (models) of the system in order to understand it and to predict or impact its future behavior. These

models may define the structure and/or the behavior of the system.

15.4.2. Natural and man-made systems

There are natural and man-made (designed) systems. Natural systems may not have an apparent objective but their outputs can be interpreted as purposes. Man-made systems are made with purposes that are achieved by the delivery of outputs. Their parts must be related; they must be "designed to work as a coherent entity" - else they would be two or more distinct systems.

15.4.3. Theoretical Framework

i. An open system exchanges matter and energy with its surroundings. Most systems are open systems; like a car, coffeemaker, or computer.

ii. A closed system exchanges energy, but not matter, with its environment; like Earth or the project Biosphere2 or 3.

iii. An isolated system exchanges neither matter nor energy with its environment; a theoretical example of which would be the universe.

15.4.4. Process and Transformation Process

A system can also be viewed as a bounded transformation process, that is, a process or collection of processes that transforms inputs

into outputs. Inputs are consumed; outputs are produced. The concept of input and output here is very broad. E.g., an output of a passenger ship is the movement of people from departure to destination.

15.4.5. Subsystem

A subsystem is a set of elements, which is a system itself, and a part of a larger system.

15.4.6. System Model

A system comprises multiple views such as planning, analysis, design, implementation, deployment, structure, behavior, input data, and output data views. A system model is required to describe and represent all these multiple views.

15.4.7. System Architecture

System architecture, using one (integrated) model for the description of both structure and behavior, belongs to a kind of system model.

Chapter 16
Management Information System

16.1. Description of MIS

A management information system (MIS) is a system or process that provides information needed to manage organizations effectively. Management information systems are regarded to be a subset of the overall internal controls procedures in a business, which cover the application of people, documents, technologies, and procedures used by managements to solve business problems such as costing a product, service or a business-wide strategy.

Management information systems are distinct from regular information systems in that they are used to analyze other information systems applied in operational activities in the organization. Academically, the term is commonly used to refer to the group of information management methods tied to the automation or support of human decision making, e.g. Decision Support Systems, Expert systems, and Executive information systems.

16.2. Features/Characteristics of Management Information System

Some features/characteristics of Management Information System are:

1. Forms: The management information system will take one of two major forms. In a manual format, an MIS is a written body of protocols that managers follow to make decisions. In support of sound decision-making, this type of MIS must include information collected from all levels of the organization. An MIS can also be a complex computer system; employees and computers collect data to be processed and packaged for use by management staff.
2. Design: The MIS must have a design that represents the outcome of many conversations between information specialists and managers. The information system will only be effective if its design serves to give information to managers when they need it. For example if both managers and information specialists are aware of the system's key principles and functions, they can ensure that the design, implementation and operation of the system results from informed decision-making.
3. Controls: A management information system includes controls. The IT-based MIS, for example, may be programmed to follow policies and procedures. Whenever a control is required by company protocol, the system will

require the appropriate manager to make a decision. As part of the control system, a good MIS also collects data on business processes and individual users. In this way, controls are not just useful for organization-wide compliance with protocols. Managers may use information collected on individuals to use in performance monitoring. They can provide feedback to ensure that employees will have the chance to improve their performance before their evaluation. When needed, managers can also reassign employees to different roles in the MIS to better achieve company goals.

4. Flow of Information Management: An MIS system includes the ability to manage information at four stages: input, data processing, output and storage. This information helps managers to solve problems and seize business opportunities. Some MIS models that enable problem-solving and business expansion through management of information flows are: transaction processing systems (used by banks), supply chain management systems (used by vendors), and customer relationship management systems (used in marketing). These systems provide the type of output managers can use to make strategic decisions to grow the business. For example, a manager can request a report of customers who might be interested in a new product under development.

5. Common Data Flows: The integration concept of MIS, common data flow concept avoids repetition and overlapping in data collection and storage, combining similar functions, and simplifying operations wherever possible. For example, in the marketing operations, orders received for goods become the basis billing of goods ordered, setting up of the accounts receivable, initiating production activity, sales analysis and forecasting etc.
6. Flexibility and ease of use: While building an MIS system all types of possible means, which may occur in future, are added to make it flexible. A feature that often goes with flexibility is the ease of use. The MIS should be able to incorporate all those features that make it readily accessible to wide range of users with easy usability.
7. Management Oriented: The system is designed form the top to work downwards. It does not mean that the system is designed to provide information directly to the top management. Other levels of management are also provided with relevant information.
8. Management Directed: Management orientation of MIS, it is necessary that management should continuously make reviews. For example, in the marketing information system, the management must determine what sales information is necessary to improve its control over marketing operations.

9. Integrated: The word 'integration' means that system has to cover of all the functional areas of an organization so as to produce more meaningful management information, with a view to achieving the objectives of the organization. It has to consider various sub-Systems, their objectives, information needs, and recognize the independence, that these sub-systems have amongst themselves, so that common areas of information are identified and processed without repetition and overlapping.
10. Heavy Element: A management information system cannot be established overnight. It takes almost 2 to 4 years to establish it successfully in an organization. Hence, long-term planning is required for MIS development in order to fulfill the future needs and objectives of the organization. The designer of an information system should therefore ensure that it would not become obsolete before it actually gets into operation. An example of such a feature of MIS may be seen in a transportation system where a highway is designed not to handle today's traffic requirements but to handle the traffic requirements five to ten years.

16.3. Advantages & Disadvantages/Challenges of Management Information System

Modern businesses have been leveraging management information systems (MIS) to manage order, organize and

manipulate the gigabytes and masses of information generated for various purposes. MIS helps businesses optimize business processes, address information needs of employees and various stakeholders and take informed strategic decisions. However, budget allocation and monitoring issues can affect the efficacy of MIS. It has its advantages and disadvantages/Challenges depending on organizational deployment and usage.

16.3.1. Dis-advantages/Challenges of Management Information System

Some of Challenges/Dis-advantages one can encounter when using or applying MIS in an Organization are discussed below.

1. The Information: Information is the starting point for MIS, which is the analysis of collected raw data such as pricing, demographics or temperatures. As defined by Haag and Cummings, "Information is data that have a particular meaning within a specific context." The current price of airfare becomes information if you are deciding which airline to fly with. Businesses constantly collect information on their customers, vendors and competitors to build strategies and make managerial decisions. The information used to do this is called business intelligence. Business intelligence relies heavily on the information's quality. The four main elements that measure its quality

are timeliness, accessibility, form and validity. Using information to make decisions outside of the necessary time parameters affects its quality of timeliness. Managers denied access to internal databases holding critical information affect its quality of accessibility. Reports used for forecasting, filled with statistical errors or in a format unusable by their receivers, affect the quality of form. References with questionable credibility affect its quality of validity. Diminished quality within any of these elements diminishes the overall quality of information, which decreases the effectiveness and efficiency of MIS.

2. Managerial Literacy: Though technology receives most of the credit, managers play an intricate role when dealing with MIS. Their literacy in both technology and information determine how effective strategies will be when implemented. A technology-literate manager will know how and when to apply technology, meaning that she will know what to purchase to execute certain processes and the most appropriate time to make the purchase. An information-literate manager is able to define what information is needed and how to access it, can convert it from information to business intelligence, and can make the best decision based on the information.
3. Expensive: Installing a management information system can be expensive for a company. Information

technology—while cheaper today than previous years—can represent a significant expense, especially for larger organizations. These systems may also require ongoing support or upgrade fees, which can represent future fixed cash outflows. Companies must create a budget to pay for these items to ensure the information system stays current with business technology. Attempting to integrate these systems with technology currently in use can also increase expenses.

4. Maintenance: Companies may need to hire maintenance individuals to help keep an electronic information system running smoothly. These individuals often need experience in computer science functions and other business topics. Not only does this increase labor costs, but it also requires additional training and ongoing education for these individuals. Business technology can change frequently, creating an environment where companies must have trained individuals who can properly maintain computers, websites, servers and other equipment in use by the management information system.
5. Ineffective: Ineffective Management information systems have the potential to become ineffective in a company's operations. As with all computer systems, the management information system is only as good as the programmer. Gathering unimportant or non-essential information can

delay business decisions because managers must request additional input. Spending too much time reprogramming or correcting issues can also increase the time spent in the decision-making process. Business owners and managers may also need extensive training on new systems, creating a learning curve that will hopefully diminish over time.

6. Systems Failure: when system fails Companies are responsible for correcting the defective operation of their information systems in order to avoid loss of revenue and customer loyalty. However, information system failure must be expected at times due to growth pains. As the company grows, the information system usually grows with it. However, when information systems break down, customers should be notified immediately, informed of the problem and the time it will take to fix it. Immediately informing customers of what's going on goes a long way in proving the company's reliability.
7. Poor Combination of Information Technology (IT) Element: The technology portion of the MIS equation consists of acquiring the necessary hardware and software to help managers gather, analyze, and access information. A business using a poor combination of IT can hinder the execution of strategies, as its hardware and software may be unable to complete the tasks the manager intends it to do. To determine what IT is necessary, managers need to

assess the business's needs, understand the industry's environment and design the best strategies to meet objectives. The IT needs to support the strategies, not vice versa.

8. Information Distribution: Information is stored on different computers or servers and managed by different information management systems, and some information many not be available to the average user. For example, a research library or archive that subscribes to several information management systems may have access to information that the common user, relying on a free Internet search engine does not. Plus, all search engines do not list all websites.
9. Relevance: Many mechanisms for example search engines in particular--do not have the ability to rank information by relevance. For example, if an individual using a search engine chooses a search term that is too broad, that user may be overwhelmed with millions of results that have nothing to do with the topic. If an individual chooses a topic that is too specific, the corresponding results may be too few.
10. Remote Management: Managing remote employees is a challenge brought about from improved technology and scarce resources. Many companies utilize the services of contingent workers in remote locations. Distance

management requires different techniques and tools, often not required when employees are located in the same place. Tools such as email, instant messaging, video conferencing and document collaboration software are essential for troubleshooting and remediating problems among remote employees.

11. Computer Security: Computer security is a major challenge facing most information technology managers. Connectivity to the Internet brings the concern of hacking, denial of service attacks and data loss to many companies. The spread of new technologies such as mobile devices and online databases has increased the attack vectors for criminals. New laws and regulations regarding computer crime and loss of customer data increase the pressure on IT managers to properly secure computing resources.
12. Cloud Computing: Cloud computing refers to computing resources available over the Internet. Cloud computing moves the software out of the corporate data center and into a third-party facility, where resources are scalable and available on demand. The cloud enables any size company to access a large data center, thus extending the company's capabilities. Such increased capacity allows for small companies to rival much larger companies with private data centers.

16.3.2. Advantages of Management Information System

An MIS provides the following advantages:

1. Facilitates planning: MIS improves the quality of plants by providing relevant information for sound decision – making. Due to increase in the size and complexity of organizations, managers have lost personal contact with the scene of operations.
2. Minimizes information overload: MIS change the larger amount of data in to summarize form and there by avoids the confusion which may arise when managers are flooded with detailed facts.
3. MIS Encourages Decentralization: Decentralization of authority is possibly when there is a system for monitoring operations at lower levels. MIS is successfully used for measuring performance and making necessary change in the organizational plans and procedures.
4. Enhance Co-ordination: MIS facilities integration of specialized activities by keeping each department aware of the problem and requirements of other departments. It connects all decision centers in the organization.
5. It makes control easier: MIS serves as a link between managerial planning and control. It improves the ability of management to evaluate and improve performance. The used computers has increased the data processing and storage capabilities and reduced the cost.

6. MIS assembles, process, stores, Retrieves, evaluates and disseminates the information.

16.4. Evolution of MIS

The earliest information systems were developed in the early 1960s. During the last 30 years, the field of IT has changed very significantly. It now represents a different set of aims, means and responsibilities than was typical in organizations in the 1970s, or in the 1980s. To understand this philosophical change, we may divide this period into three eras of IT and study how this shift has taken place. These eras are: Data processing (DP) era (1960s onwards), Management information systems (MIS) era (1970s onwards) and Strategic information systems (SIS) era (1980s onwards). Managing and controlling IT in an organisation in these three eras involves different approaches, many of which are determined by the applications possible and undertaken. The essential characteristics of the three eras are summarized below.

Data processing (DP) era

This era is dominated by information systems that have as their primary function the processing of predefined (business) transactions to produce fixed-format reports on schedule. Their principal use is to automate the basic business processes of the organisation. Typical transactions handled by these systems are payroll records, customer orders and purchase orders. In

addition, these systems could also provide predefined exception reports based on the transactions processed.

As these systems processed the transaction data of the organisations without producing much management information, they are called data processing systems (DPS), which also explains why this era is called the data processing era.

Management Information Systems (MIS) era

The primary function of information systems developed in this era, called management information systems, was to provide two new capabilities to the users:

- **Enquiry** i.e., flexible data base access initiated by ad hoc user requests (for searching an item of information)
- **Analysis** i.e., flexible user-driven processing (such as generating 'what if' scenarios for testing implications of planning models).

These capabilities were mainly useful for managers and professionals in satisfying their information needs. That is why these systems are called management information systems. During the last decade, the use of management information systems by managers and professionals has grown exponentially, stimulated by the increasing supply of sophisticated software tools for end-user computing available on mainframes, micros and through outside time-sharing services.

Strategic Information Systems (SIS) Era

Strategic information systems (SIS) are systems that are used to support or shape the competitive strategy of the organisation: its plan for gaining or maintaining competitive advantage or reducing the advantage of its competitors. Frequently, such systems extend beyond the bounds of the organisation itself to its customers or clients, suppliers and competitors.

A strategic information system may be either a data processing system or a management information system (or management support system). The dimension which makes a system strategic is that it directly supports or shapes the competitive strategy of the organization. An SIS has three characteristics as discussed below.

- It significantly changes business performance as measured by one or more key indicators. Whereas a DPS or an MIS/MSS might provide a 30% return on investment, an SIS can return 10 times that amount.
- An SIS contributes to attaining a strategic goal. If a system is one of the few components that is critical to the successful attainment of a business goal, such as increasing the sales volume of a product by a specified percentage, then it is an SIS.
- A system is an SIS if it fundamentally changes the way the company does business, or the way it competes, or the way it deals with its customers or suppliers, as for example by

opening up a new distribution channel for a company's products or services.

An SIS differs from other systems in two other ways:

- SIS development will not conform to conventional system development life cycles. When a new service or product is being created, the IS to support it cannot be completely specified and added to the way the firm does business.
- An SIS will generally change the focus of IS development from its function to its use. What becomes critical here is the use of IT to support or shape strategy rather than the capability to process transactions or do query and analysis. SIS planners should, therefore, discover application opportunities through reflection, by thinking about how the use of IT can enable the organisation designed at the outset. Such contemplation requires that an SIS be created first as a prototype, tested on a small scale by the customers, and then iteratively developed into full scale.

Chapter 17
Managements and its Function

17.1. Description of Management

Management is a universal phenomenon. It is a very popular and widely used term. All organizations – business, political, cultural or social are involved in management because it is the management which helps and directs the various efforts towards a definite purpose. According to Harold Koontz, "Management is an art of getting things done through and with the people in formally organized groups. It is an art of creating an environment in which people can perform and individuals and can co-operate towards attainment of group goals". According to F.W. Taylor, "Management is an art of knowing what to do, when to do and see that it is done in the best and cheapest way".

Management is a purposive activity. It is something that directs group efforts towards the attainment of certain pre – determined goals. It is the process of working with and through others to effectively achieve the goals of the organization, by efficiently using limited resources in the changing world. Of course, these goals may vary from one enterprise to another. E.g.:

For one enterprise it may be launching of new products by conducting market surveys and for other it may be profit maximization by minimizing cost.

Management involves creating an internal environment: - It is the management which puts into use the various factors of production. Therefore, it is the responsibility of management to create such conditions which are conducive to maximum efforts so that people are able to perform their task efficiently and effectively. It includes ensuring availability of raw materials, determination of wages and salaries, formulation of rules & regulations etc.

Therefore, we can say that good management includes both being effective and efficient. Management can be desrcibe in detail in following categories:

Management as a Process

As a process, management refers to a series of interrelated functions. It is the process by which management creates, operates and directs purposive organization through systematic, coordinated and co-operated human efforts, according to George R. Terry, "Management is a distinct process consisting of planning, organizing, actuating and controlling, performed to determine and accomplish stated objective by the use of human

beings and other resources". As a process, management consists of three aspects:

- Management is a social process – Since human factor is most important among the other factors, therefore management is concerned with developing relationship among people. It is the duty of management to make interaction between people – productive and useful for obtaining organizational goals.
- Management is an integrating process – Management undertakes the job of bringing together human physical and financial resources so as to achieve organizational purpose.
- Management is a continuous process – It is a never ending process. It is concerned with constantly identifying the problem and solving them by taking adequate steps. It is an on-going process.

Management as an Activity

Like various other activities performed by human beings such as writing, playing, eating, cooking etc, management is also an activity because a manager is one who accomplishes the objectives by directing the efforts of others. According to Koontz, "Management is what a manager does". Management as an activity includes –

Informational activities – In the functioning of business enterprise, the manager constantly has to receive and give information orally or in written. A communication link has to be maintained with subordinates as well as superiors for effective functioning of an enterprise.

Decisional activities – Practically all types of managerial activities are based on one or the other types of decisions. Therefore, managers are continuously involved in decisions of different kinds since the decision made by one manager becomes the basis of action to be taken by other managers. (E.g. Sales Manager is deciding the media & content of advertising).

Inter-personal activities – Management involves achieving goals through people. Therefore, managers have to interact with superiors as well as the sub-ordinates. They must maintain good relations with them. The inter-personal activities include with the sub-ordinates and taking care of the problem. (E.g. Bonuses to be given to the sub-ordinates).

Management as a Discipline

Management as a discipline refers to that branch of knowledge which is connected to study of principles & practices of basic administration. It specifies certain code of conduct to be followed by the manager & also various methods for managing resources efficiently. Management as a discipline specifies certain code of conduct for managers & indicates various methods of managing

an enterprise. Management is a course of study which is now formally being taught in the institutes and universities after completing a prescribed course or by obtaining degree or diploma in management, a person can get employment as a manager. Any branch of knowledge that fulfills following two requirements is known as discipline:

There must be scholars & thinkers who communicate relevant knowledge through research and publications.

The knowledge should be formally imparted by education and training programmes. Since management satisfies both these problems, therefore it qualifies to be a discipline. Though it is comparatively a new discipline but it is growing at a faster pace.

Management as a Group

Management as a group refers to all those persons who perform the task of managing an enterprise. When we say that management of Yaba College of Technology is good, we are referring to a group of people those who are managing. Thus as a group technically speaking, management will include all managers from chief executive to the first – line managers (lower-level managers). But in common practice management includes only top management i.e. Chief Executive, Chairman, General Manager, Board of Directors etc. In other words, those who are concerned with making important decisions, these persons enjoy the authorities to use resources to accomplish

organizational objectives & also responsibility to for their efficient utilization. Management as a group may be looked upon in 2 different ways. All managers taken together or Only the top management.

Management as a Science

Science is a systematic body of knowledge pertaining to a specific field of study that contains general facts which explains a phenomenon. It establishes cause and effect relationship between two or more variables and underlines the principles governing their relationship. These principles are developed through scientific method of observation and verification through testing.
Science is characterized by following main features:

- Universally acceptance principles – Scientific principles represents basic truth about a particular field of enquiry. These principles may be applied in all situations, at all time & at all places. E.g. – law of gravitation which can be applied in all countries irrespective of the time. Management also contains some fundamental principles which can be applied universally like the Principle of Unity of Command i.e. one man, one boss. This principle is applicable to all type of organization – business or non business.
- Experimentation & Observation – Scientific principles are derived through scientific investigation & researching i.e.

they are based on logic. E.g. the principle that earth goes round the sun has been scientifically proved. Management principles are also based on scientific enquiry & observation. They have been developed through experiments & practical experiences of large no. of managers. E.g. it is observed that fair remuneration to personal helps in creating a satisfied work force.

- Cause & Effect Relationship – Principles of science lay down cause and effect relationship between various variables. E.g. when metals are heated, they are expanded. The cause is heating & result is expansion. .The same is true for management, therefore it also establishes cause and effect relationship. E.g. lack of parity (balance) between authority & responsibility will lead to ineffectiveness. If you know the cause i.e. lack of balance, the effect can be ascertained easily i.e. in effectiveness. Similarly if workers are given bonuses, fair wages they will work hard but when not treated in fair and just manner, reduces productivity of organization.
- Test of Validity & Predictability – Validity of scientific principles can be tested at any time or any number of times i.e. they stand the test of time. Each time these tests will give same result. Moreover future events can be predicted with reasonable accuracy by using scientific principles. E.g. H2 & O2 will always give H2O. Principles

of management can also be tested for validity. E.g. principle of unity of command can be tested by comparing two persons – one having single boss and one having 2 bosses. The performance of 1st person will be better than 2nd.

Note: It cannot be denied that management has a systematic body of knowledge but it is not as exact as that of other physical sciences like biology, physics, and chemistry etc. The main reason for the inexactness of science of management is that it deals with human beings and it is very difficult to predict their behavior accurately. Since it is a social process, therefore it falls in the area of social sciences. It is a flexible science & that is why its theories and principles may produce different results at different times and therefore it is a behavior science. Ernest Dale has called it as a Soft Science.

Management as an Art

Art implies application of knowledge & skill to trying about desired results. An art may be defined as personalized application of general theoretical principles for achieving best possible results. Art has the following characters –

- Practical Knowledge: Every art requires practical knowledge therefore learning of theory is not sufficient. It is very important to know practical application of theoretical principles. E.g. to become a good painter, the

person may not only be knowing different colour and brushes but different designs, dimensions, situations etc to use them appropriately. A manager can never be successful just by obtaining degree or diploma in management; he must have also know how to apply various principles in real situations by functioning in capacity of manager.

- Personal Skill: Although theoretical base may be same for every artist, but each one has his own style and approach towards his job. That is why the level of success and quality of performance differs from one person to another. E.g. there are several qualified painters but Mr. Jomoto is recognized for his style. Similarly management as an art is also personalized. Every manager has his own way of managing things based on his knowledge, experience and personality, that is why some managers are known as good managers whereas others as bad.
- Creativity: Every artist has an element of creativity in line. That is why he aims at producing something that has never existed before which requires combination of intelligence & imagination. Management is also creative in nature like any other art. It combines human and non-human resources in useful way so as to achieve desired results. It tries to produce sweet music by combining chords in an efficient manner.

- Perfection through practice: Practice makes a man perfect. Every artist becomes more and more proficient through constant practice. Similarly managers learn through an art of trial and error initially but application of management principles over the years makes them perfect in the job of managing.
- Goal-Oriented: Every art is result oriented as it seeks to achieve concrete results. In the same manner, management is also directed towards accomplishment of pre-determined goals. Managers use various resources like men, money, material, machinery & methods to promote growth of an organization.

Thus, we can say that management is an art therefore it requires application of certain principles rather it is an art of highest order because it deals with molding the attitude and behavior of people at work towards desired goals.

Management as a Profession

A profession may be defined as an occupation that requires specialized knowledge and intensive academic preparations to which entry is regulated by a representative body. The essentials of a profession are: Specialized Knowledge, Formal Education & Training, Social, Code of Conduct, and Representative Association. From above discussion, it is quite clear that management fulfills

several essentials of a profession; even then it is not a full-fledged profession.

17.2. Levels of Management

The term "Levels of Management' refers to a line of demarcation between various managerial positions in an organization. The number of levels in management increases when the size of the business and work force increases and vice versa. The level of management determines a chain of command, the amount of authority & status enjoyed by any managerial position. The levels of management can be classified in three broad categories:

- Top level / Administrative level
- Middle level / Executory
- Low level / Supervisory / Operative / First-line managers

Managers at all these levels perform different functions. The role of managers at all the three levels is discussed below:

Top Level of Management: It consists of board of directors, chief executive or managing director. The top management is the ultimate source of authority and it manages goals and policies for an enterprise. It devotes more time on planning and coordinating functions. The role of the top management can be summarized as follows –

1. Top management lays down the objectives and broad policies of the enterprise.
2. It issues necessary instructions for preparation of department budgets, procedures, schedules etc.
3. It prepares strategic plans & policies for the enterprise.
4. It appoints the executive for middle level i.e. departmental managers.
5. It controls & coordinates the activities of all the departments.

6. It is also responsible for maintaining a contact with the outside world.
7. It provides guidance and direction.
8. The top management is also responsible towards the shareholders for the performance of the enterprise.

Middle Level of Management: The branch managers and departmental managers constitute middle level. They are responsible to the top management for the functioning of their department. They devote more time to organizational and directional functions. In small organization, there is only one layer of middle level of management but in big enterprises, there may be senior and junior middle level management. Their role can be emphasized as –

1. They execute the plans of the organization in accordance with the policies and directives of the top management.
2. They make plans for the sub-units of the organization.
3. They participate in employment & training of lower level management.
4. They interpret and explain policies from top level management to lower level.
5. They are responsible for coordinating the activities within the division or department.
6. It also sends important reports and other important data to top level management.

7. They evaluate performance of junior managers.
8. They are also responsible for inspiring lower level managers towards better performance.

Lower Level of Management: Lower level is also known as supervisory / operative level of management. It consists of supervisors, foreman, section officers, superintendent etc. According to *R.C. Davis*, "Supervisory management refers to those executives whose work has to be largely with personal oversight and direction of operative employees". In other words, they are concerned with direction and controlling function of management. Their activities include –

1. Assigning of jobs and tasks to various workers.
2. They guide and instruct workers for day to day activities.
3. They are responsible for the quality as well as quantity of production.
4. They are also entrusted with the responsibility of maintaining good relation in the organization.
5. They communicate workers problems, suggestions, and recommendatory appeals etc to the higher level and higher level goals and objectives to the workers.
6. They help to solve the grievances of the workers.
7. They supervise & guide the sub-ordinates.
8. They are responsible for providing training to the workers.

9. They arrange necessary materials, machines, tools etc for getting the things done.
10. They prepare periodical reports about the performance of the workers.
11. They ensure discipline in the enterprise.
12. They motivate workers.
13. They are the image builders of the enterprise because they are in direct contact with the workers.

17.3. Management Objectives

The main objectives of management are:

1. Getting Maximum Results with Minimum Efforts – The main objective of management is to secure maximum outputs with minimum efforts & resources. Management is basically concerned with thinking & utilizing human, material & financial resources in such a manner that would result in best combination. This combination results in reduction of various costs.
2. Increasing the Efficiency of factors of Production – Through proper utilization of various factors of production, their efficiency can be increased to a great extent which can be obtained by reducing spoilage, wastages and breakage of all kinds, this in turn leads to saving of time, effort and money which is essential for the growth & prosperity of the enterprise.

3. Maximum Prosperity for Employer & Employees – Management ensures smooth and coordinated functioning of the enterprise. This in turn helps in providing maximum benefits to the employee in the shape of good working condition, suitable wage system, incentive plans on the one hand and higher profits to the employer on the other hand.
4. Human betterment & Social Justice – Management serves as a tool for the upliftment as well as betterment of the society. Through increased productivity & employment, management ensures better standards of living for the society. It provides justice through its uniform policies.

17.4. Management Function/Activities

An individual who gets the thing done is a Manager. It is necessary to distinguish between the task and the functions. While manager may perform the task such as accounting, selling, manufacturing, purchasing, etc. These activities are called as tasks and not as functions. The activities that are performed through the managerial functions are: planning, organization, staffing, directing coordinating and controlling.

1. Planning: is a process of determining the goals and objectives and evolving strategies policies, programmers and procedures for the achievement of organization goals.
2. Organizing: It involves evolving the structure of the people working in the organization and their roles. It specifies an authority structure and assigns activities to the people backed

by the delegation of authority. Building a meaningful effective structure of authority and the relationship is known as organizing.

3. Staffing: it involves manning the positions in the organization structure. It requires defining the manpower needs per position or center of activity. It requires appropriate selection of the person or persons ensuring that they together will achieve the goals and objectives of the organization.
4. Directing is a complex task of implementing the process of management. In the process, the manager is required to guide, clarify and solve the problems of the people and their activities. It is necessary to motivate the people to work for the goal with an interest and a confidence.
5. Coordinating is the function which brings a harmony and smoothness in the various group activities and individual efforts directed towards the accomplishment of goals. It is a process of synchronizing individual actions and the efforts which may differ because of the differences in the personal goals and the common goals, the differences in the interpretation of methods and directions. It is, therefore, necessary to undertake centrally a process of coordinating and reconciling the differences in the approach, timing, efforts and interests towards a common goal. This task is to be carried out by the authority placed at a higher level in the organization structure.

6. Controlling is a process of measurement of an output, comparing it with the goals, the objectives and the target, and taking corrective actions, if the output is falling short of the stated norms. Controlling ensures an achievement of the plan. The essence of the control lies in good planning. It helps to evaluate the performance, highlights abnormal deviations, and guides a manager to take specific corrective actions.

Chapter 18
Components of Management Information System

18.1. Description of MIS Components

Component of management information systems are the various form of tools, methodologies or procedure that is applicable in achieving the basic goals of management information system in an organization. Some of the important components of MIS are discussed as follows:

18.2. Transaction Processing System (TPS)

A TPS collects and stores information about transactions, and controls some aspects of transactions. A transaction is an event of interest to the organization. e.g. a sale at a store. A TPS is a basic business system that has the following features:

1. TPS is often tied to other systems such as the inventory system which tracks stock supplies and triggers reordering when stocks get low;
2. TPS serves the most elementary day-to-day activities of an organization;
3. TPS supports the operational level of the business

4. TPS supplies data for higher-level management decisions (e.g. MIS, EIS);
5. TPS is often critical to survival of the organization
6. TPS is mostly for predefined, structured tasks.
7. TPS usually has high volumes of input and output

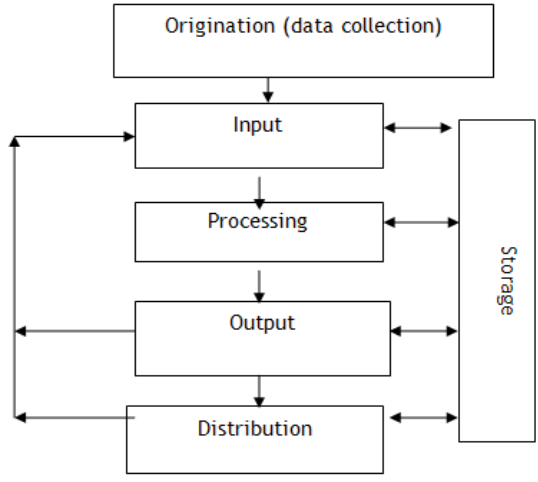
Stages Involve In Transaction Processing System

Stages of TPS include: origination, input, processing, storage, output and distribution.

1. Origination: This is the collection of original (primary) data. It is possible to collect data and store it away in a secondary storage medium pending the time the data would be required for processing.
2. Input: This means feeding the data into the computer. Data is prepared in a convenient/suitable form for processing. The form of input device used depends on the data processing method. e.g. punch cards are used in electromechanical data processing while magnetic tape, disk, keyboard (terminal) are used in electronic data processing.
3. Processing: This is a planned series of actions and operations performed on data to convert the data to a more meaningful form called information.

4. Storage: storage of data/Information could take place at any stage for future purposes. The double-headed arrows show the storage of data/information at one time, and the stored data/information serving as input for processing at another time.
5. Output: This is the result of the processed data (information). At times, the information produced today could be distributed to the appropriate end-users; at some other times, the information could be used as input for another data processing cycle.
6. Distribution: This is the dissemination of information produced, to the appropriate quarters for decision-making. The decision-makers are the end-users of information.

The TPS cycle is depicted in the following diagram.



TPS stages

Controls in Transaction Processing System

Control in Transaction Processing System (TPS) involves all measured put in place towards hitch free in every stages of Transaction Processing.

Types of Control in Transaction Processing

Input control: This includes the control procedure as in activities involve on data before its fetch into the system for processing.

Processing control: This is referred to as validation check which involve editing of input data and use of control qualities during processing.

Output control: This includes comparing of the inputs with output, ascertaining that the program is correct and no fraudulent and testing the program before going into use.

Operational Control: These involve the control of access to the computer system and probably make available an alternative computer in case of computer failure.

Purpose of Control in Transaction Processing System

i. To ensure that all data are valid and processed properly
ii. To ensure that error are detected, corrected, and reprocessed.
iii. To maintain operational efficiency within the organization
iv. To prevent and detect fraud.

18.3. Information Reporting System (IRS)

Information Reporting Systems, also referred to as Management Reporting Systems produce reports that have been defined in advance for day-today decision-making needs. Its main purpose is to provide the right information to the right people at the right time within an organization.

Management Reporting Systems-obtains summarized data from Transaction Processing Systems (TPS) to produce feedback reports on operation. It is important that information systems are designed to provide information needed for effective decision making by managers. The Management Reporting Systems is hence seen as a formal system for providing management with accurate and timely information necessary for decision making. The MRS provides information on the past, present and project future and on relevant events inside and outside the organization. It may be defined as a planned and integrated system for gathering relevant data, converting it in to right information and supplying the same to the concerned executives.

There are two main types of report that these IRsystems produce:

- Periodic Reports - These are predefined reports that are required by decision makers at regular intervals. Examples include a monthly financial statement and a weekly sales analysis.

- Exception Reports - These are reports produced only when required. They can be generated automatically by the information system when a performance measure moves outside a predefined range. Examples include sales falling below a certain level and customers exceeding their credit limits. Exception reports can also be generated manually when a decision maker does not want to wait until the next scheduled periodic report or the information is only occasionally required.

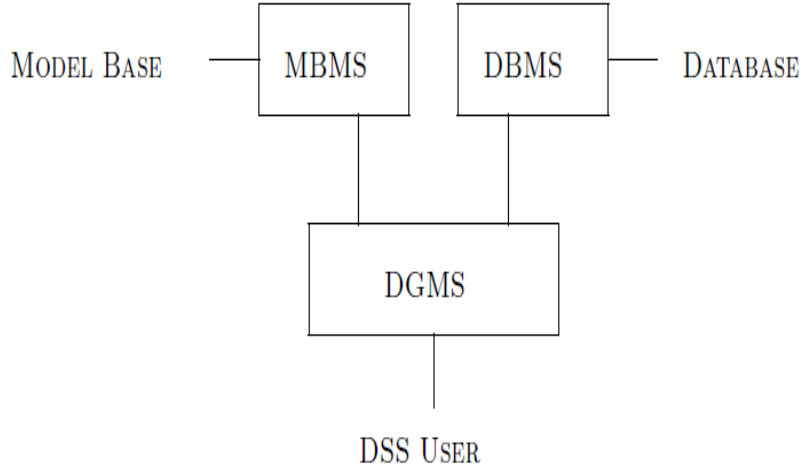
18.4. Decision Support System (DSS)

Decision support systems are interactive, computer-based systems that aid users in judgment and choice activities. They provide data storage and retrieval but enhance the traditional information access and retrieval functions with support for model building and model-based reasoning. They support framing, modeling, and problem solving. A typical application area of DSSs is management and planning in business. Decision support systems are typically used for strategic and tactical decisions faced by upper-level management decisions with a reasonably low frequency and high potential consequences in which the time taken for thinking through and modeling the problem pays generously in the long run. There are three fundamental components of DSSs

- Database Management System (DBMS). A DBMS serves as a data bank for the DSS. It stores large quantities of data that are relevant to the class of problems for which the DSS has been designed and provides logical data structures (as opposed to the physical data structures) with which the users interact. A DBMS separates the users from the physical aspects of the database structure and processing. It should also be capable of informing the user of the types of data that are available and how to gain access to them.
- Model-base management system (MBMS). The role of MBMS is analogous to that of a DBMS. Its primary function is providing independence between specific models that are used in a DSS from the applications that use them. The purpose of an MBMS is to transform data from the DBMS into information that is useful in decision making. Since many problems that the user of a DSS will cope with may be unstructured, the MBMS should also be capable of assisting the user in model building.
- Dialog generation and management system (DGMS). The main product of an interaction with a DSS is insight. As their users are often managers who are not computer-trained, DSSs need to be equipped with intuitive and easy-to-use interfaces. These interfaces aid in model building, but also in interaction with the model, such as gaining

insight and recommendations from it. The primary responsibility of a DGMS is to enhance the ability of the system user to utilize and benefit from the DSS.

User interacts with the DSS through the DGMS. The diagram below illustrate the how user interact with Decisions support system at large.



18.5. Executive Information System (EIS)

Executive Information System also known as Executive Support System (ESS), it provides executives information in a readily accessible, interactive format. They are a form of MIS intended for top-level executive use. An EIS/ESS usually allows

summary over the entire organization and also allows drilling down to specific levels of detail.

An executive information system (EIS) is a type of management information system that facilitates and supports senior executive information and decision-making needs. It provides easy access to internal and external information relevant to organizational goals. It is commonly considered a specialized form of decision support system (DSS)

They also use data produced by the ground-level TPS so the executives can gain an overview of the entire organization. Used by top level (strategic) management. They are designed to the individual. They let the CEO of an organization tie in to all levels of the organization. They are very expensive to run and require extensive staff support to operate.

Advantages and disadvantages

Advantages of EIS are:

1. Easy for upper-level executives to use, extensive computer experience is not required in operations
2. Provides timely delivery of company summary information
3. Information that is provided is better understood
4. EIS provides timely delivery of information. Management can make decisions made promptly.
5. Improves tracking information

6. Offers efficiency to decision makers

Disadvantages of EIS

Disadvantages of EIS are:

1. System dependent
2. Limited functionality, by design
3. Information overload for some managers
4. Benefits hard to quantify
5. High implementation costs
6. System may become slow, large, and hard to manage
7. Need good internal processes for data management
8. May lead to less reliable and less secure data

18.6. Office Automation System (OAS)

Description of Office Automation

The term office automation refers to all tools and methods that are applied to office activities which make it possible to process written, visual, and sound data in a computer-aided manner. Office automation is intended to provide elements which make it possible to simplify, improve, and automate the organisation of the activities of a company or a group of people (management of administrative data, synchronization of meetings, etc.).

Advantages of Office Automation

Some of advantages of office automation are:

1. Office automation can get many tasks accomplished faster.
2. It eliminates the need for a larger staff.
3. Less storage space is required for data.
4. Copies of data can be easily transferred off-site for safekeeping in case of fire or other emergency.
5. Multiple people can be updated information simultaneously in the event of schedule changes.
6. OAS provides individual's effective ways to process personal and organizational data, perform calculations, and create documents. e.g. word processing, spreadsheets, file managers, personal calendars, presentation packages.

Disadvantages of Office Automation System

Dis-advantages of office automation includes the following

1. Older staff members may have a harder time adjusting to the new technology and be unable to use it efficiently.
2. Amount of money required to implementing and the cost of maintenance of OAS tools may be at high sides for an organization.

18.7. Artificial Intelligence/Expert Systems

"An expert system is a computer system or program that uses artificial intelligence techniques to solve problems that ordinarily require a knowledgeable human. Expert systems are

built with decision-making rules, and they can ask humans a series of questions to narrow down the correct answer. The human experts do not need to be physically present to accomplish a specialized project or task. Expert systems are only designed to be "expert" in a very narrow and specific task or subject field. They contain the acquired expert knowledge and try to imitate the expert's evaluation processes to offer a conclusion.

Expert systems imitate human experts in many different fields of expertise. Among some of the successful expert systems developed are INTERNIST, a medical diagnosis tool that contains nearly 100,000 relationships between symptoms and diseases, and PROSPECTOR, an aid to geologists in interpreting mineral data." Expert systems usually contain two components: a knowledge base and an inference engine program, enabling it to suggest conclusions. The knowledge base is programmed in an IF ... THEN logical rules structure. Such a structure is a series of IF conditions that, if met, THEN a specific result may be concluded.

Advantages of Expert Systems:

1. An advantage of an expert system is that it may include the knowledge of many experts in one specific field.
2. The computer can store far more information than a human.
3. The computer does not 'forget', make silly mistakes or get drunk when it is most needed.

4. Data can be kept up-to-date.
5. The expert system is always available 24 hours a day and will never 'retire'.
6. The system can be used at a distance over a network.

Dis-advantages of Expert System

1. Where common sense is required in making decision, expert system may be useful. Because it lacks common sense needed in some decision making.
2. Expert System cannot make creative responses as human expert would in unusual circumstances.
3. Domain experts not always able to explain their logic and reasoning.
4. Errors may occur in the knowledge base, and lead to wrong decisions.
5. Expert system cannot adapt to changing environments, unless knowledge base is changed. And changing knowledge base may be time consuming, require experts and finances.

Chapter 19
Computer and Society

19.1. Place of Computer in the Society

The computer has changed the society today as much as industrial revolution changed society in 18th and 19th century. People interact directly with computer in education, finance, government, health care, science, publishing, tourism, and industry. Computers help them to do their work faster and more efficient by using the software application that consists of special program for specific task. Some of the areas of application of Computers are discussed in section 19.2.

19.2. Areas of Computer Application in the Society

19.2.1 Education

Computers are used in schools, colleges and universities in order to promote better education by using computers. In the labs, students use software packages to complete their assignments. At the same time, some educators use the computer-based training and web-based training as replacements for lecture presentation. Some of the software applications that are usually used in schools and universities include Microsoft Office, Adobe Photoshop, Macromedia Flash, AutoCAD, Macromedia Dreamweaver and

Macromedia Director. Open Distance Learning (ODL) or online learning can be implemented as computers are the main medium in delivering the knowledge from one location to the other locations. This type of learning consists of online forum, discussion, quizzes, test questions and many more.

19.2.2 Business

People use finance or accounting software to balance check books, pay bills, track personal income and expenses, manage investments and evaluate their financial plans. Accounting software helps companies to record and report their financial transactions. Examples of these software applications include MYOB, Intuit Quick Books and Peachtree Complete Accounting.

19.2.3 Banking

In the banking sector, many financial institutions offer online banking. People can access their financial records from anywhere in the world. Most of the packages on banking offer a variety of online services. Which requires access to the web? For example we can track our investment online, compare insurance rates and do online banking.

19.2.4 Industry

With the use of CAM system, computers record actual labor, material, machine and computer time used to manufacture a

particular product. Computers process this data and automatically update inventory, production, payroll and accounting records on the company's network.

19.2.5 Graphics and Multimedia

Computers are crucial in publishing especially in the process of making works available to the public. These works include magazines, books, newspapers, music and film production. Special software applications are used to assist graphic designers to develop graphics, texts, photographs and composing songs. Computer-Aided Design, Desktop Publishing, Paint/Image Editing, Video and Audio Editing and Multimedia Authoring are among the popular applications software.

19.2.6 Communication

A government provides society with direction by making and administering policies. Most government offices or agencies have websites in order to provide citizens with up-to-date or latest information. Examples of software applications used for communication include e-mail, web browsers, newsgroups, instant messaging and video conferencing.

19.2.7 Computers In Healthcare

In the medical field, computers are very important in running the operations. Medical staffs use computers for various purposes,

such as maintaining patient records, monitoring patients' vital sign. Assisting doctors, nurses and technicians with medical tests by using computer and computerized devices and using medical software to help with researching and diagnosing health conditions.

19.2.8 Science

In the scientific world, computers are used in all fields of science from biology to astronomy to meteorology and others. These are things that can be done by computers, for examples collecting, analyzing and modeling data, serving as medium of communication with colleagues around the world, contributing to new inventions or breakthrough in surgery, medicine and treatment etc.

19.2.9 Crime Investigation

High end computer devices have ensured that justice is more effective. CCTV cameras and other computer operated security systems have reduced the amount of crime. And if it still happens there are many ways to track down the criminal in no time. Forensic science employs computers for many of its operations related to investigations.

19.2.10 Entertainment

The field of entertainment has been revolutionized by computers. Animation, graphic image manipulation etc has made the entertainment experience hundred times better. Computer gaming is achieving new landmarks in terms of technology. Movie making, editing, music composition etc everything needs computers. This is only the tip of the iceberg and the uses of computers in society are many more. But then the development of computer technology has also given rise to many vices like identity theft.

19.2.11 Government

The Government can use computers for the processing of immigration, tax collection/administration, keeping tracks of criminals, computing budgets and statutory allocations, Civil Service Records, computing wages, salaries, gratuities and pensions etc.

19.2.12 Robotics

Robots are information machines with the manual dexterity to perform tasks too unpleasant, too dangerous, or too critical to assign to human beings. For example, robots are used in defense to perform underwater military missions; robots could be used for welding or paint-spraying in factories, and in car assembling.

19.2.13 Energy

Energy companies use computers and geological data to locate oil, coal, natural gas and other mineral resources. Meter-readers use hand-held computers to record how much energy is used in a month in homes and businesses. Computers can analyze the fuel consumption in our cars.

19.2.14 Transportation

Computers are being used to schedule travelling reservation, and to control traffic, especially by the Aviation Industry, to prevent collision of airplane in the air.

19.3. Man and the use of Computer

Present-day computers are designed primarily to solve preformulated problems or to process data according to predetermined procedures. The course of the computation may be conditional upon results obtained during the computation, but all the alternatives must be foreseen in advance. Without man, computer cannot perform any useful operation. As result the intelligent performances of computer depend on intelligence performance of man (computer users). Computer require program, it is the man that programed computer system. I.e. men think for computer first before it can perform any useful operation.

Computer is a tool to enhance human operations in all area of application of computer in the society.

Chapter 20
Design of MIS for an Organization (Case of MF institutions)

20.1. Management Information System Vs Microfinance Institution

Management Information System (MIS) can be defined as collecting and processing of raw data into useful information and its dissemination to the user in the required format. It consists of information, which impacts managements to feel the pulse of the organization and take decisions accordingly. In fact a full MIS consists of all the systems that the institution uses too generate the information that guide management's decisions and actions.

Microfinance Institutions (MFI'S), over the past few years, have been paying increasing attention to information systems. They are increasingly realizing that information lies at the very heart of microfinance.

The practitioners as well as donors have become aware of the vital need for formal and informal financial institutions to manage large amounts of data. As a result, there is a massive drive to improve the effective understanding and use of these data. Needless to say that it is no possible to collect and collate large

volumes of data without adopting new technology. As a result the MFIs are watching the developments in information technology very closely.

20.2. Uses of Management Information System in MFIs

Since it can be programmed to follow business rules uniformly, MIS reinforces discipline in accounting and portfolio tracking. Computers can link all data pertaining to a customer or customer group hence MIS can provide a consolidated view of each customer or group.

i. MIS allow for single entry of data that can then be used by many people. Data once entered can be accessed, manipulated and used by all users. Thus MIS reduces duplication of effort and increases speed of work.
ii. MIS integrates information and process.
iii. MIS supports workflow and procedures for users.
iv. MIS can be ported to remote areas via laptop or palm technology.
v. MIS application can be customized or enhanced to support new products and institutional growth.

20.3. Management Information System Design Phases

There are 3 major phases in designing of management information system for an organization. Each of the stages and activities under it are discussed below.

Phase I: Defining Needs

The activities in this phase of MIS design include the following:

I. Collect existing documentation
II. Create process flowcharts
III. Identify where data is collected
IV. Identify what people need
V. Assess the current system
VI. Project future needs
VII. Determine what is feasible and appropriate
VIII. Staff capabilities
IX. Cost issues
X. Decide on your needs

Phase II: Assessing the Alternatives

Step 1: Generate and screen list of alternatives

Research options

Screen out clearly inappropriate options

Step 2: Initial Software Assessment

Group products by module

Complete functional comparison tables

Assess vendor support

Assess each individual module

Rate the "fit" for each product

Eliminate inappropriate options

Step 3: Detailed Software Assessment

Thorough testing of demo software

Discussions/negotiations with vendors

Step 4: Final decision and system strategy

i. Integrated vs. Hybrid
ii. Use commercial off-the-shelf software, or
iii. Modify commercial software, or
iv. Develop custom software

Phase III: System Implementation

i. Setting up the hardware
ii. Preparing and revising documentation
iii. Configuring the system
iv. Testing
v. Training
vi. Transferring the data
vii. Change over
viii. System maintenance

20.4. Management Information System Model

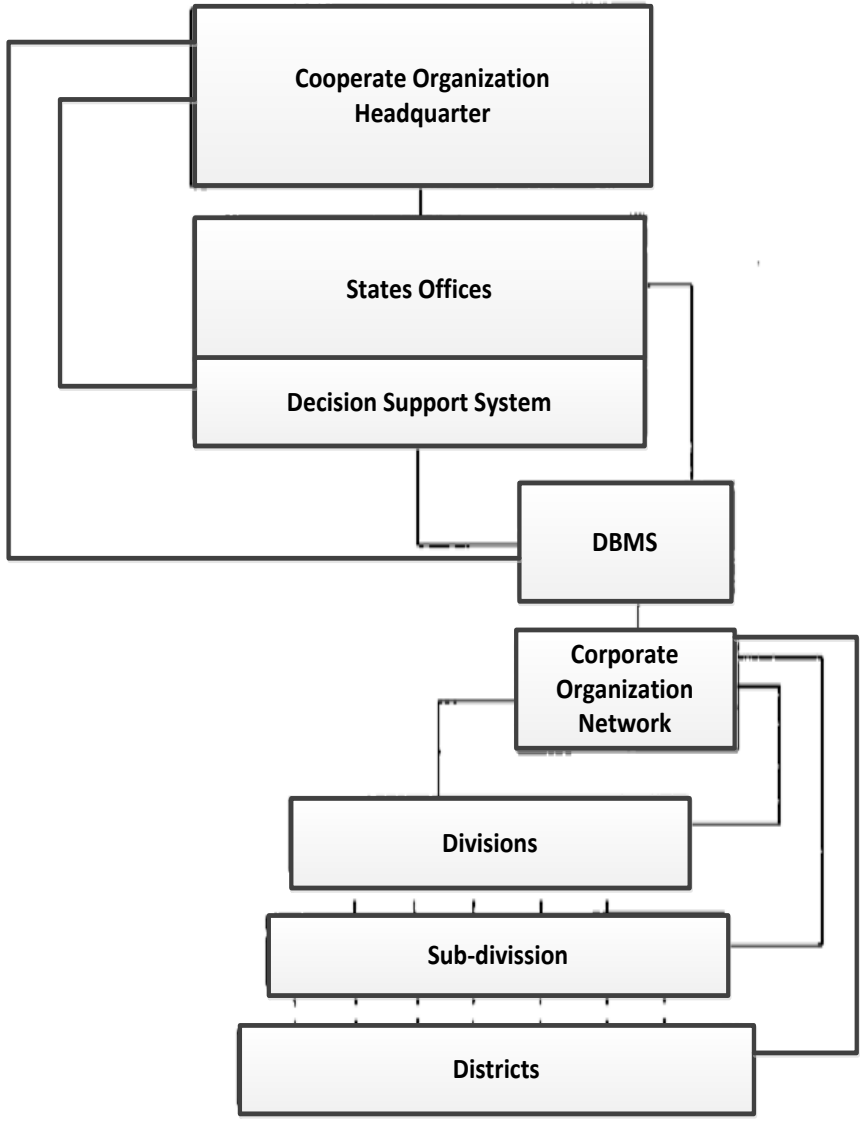
The actual design may vary with the size of the organization and other considerations. An integrated database for the entire organization may be supported by a mainframe/minicomputer at the organization headquarters.

Suitable programmes for the analysis of data may be designed to provide an interactive decision support system at all level of organization. Each district and subdivision may be provided with

a mini/microcomputer, depending on the volume of data to be handled.

The computers in the districts and subdivisions may be networked with the headquarter computer. The local data may be stored and processed in the district/subdivision, and the shared data with appropriate level of aggregation may be transmitted to the headquarters to update the integrated database.

The department and subdivisions would have direct access to the integrated database with proper authorizations assigned to them through their passwords. The blocks may have only the input-output terminals connected to the subdivision computer to feed data to the subdivision and make on-line inquiries as and when necessary. The diagram below illustrates the design of MIS system for a corporate organization that operates nationwide in a country like Nigeria. We assume that the organization has headquarter office, state offices, districts and sub division.

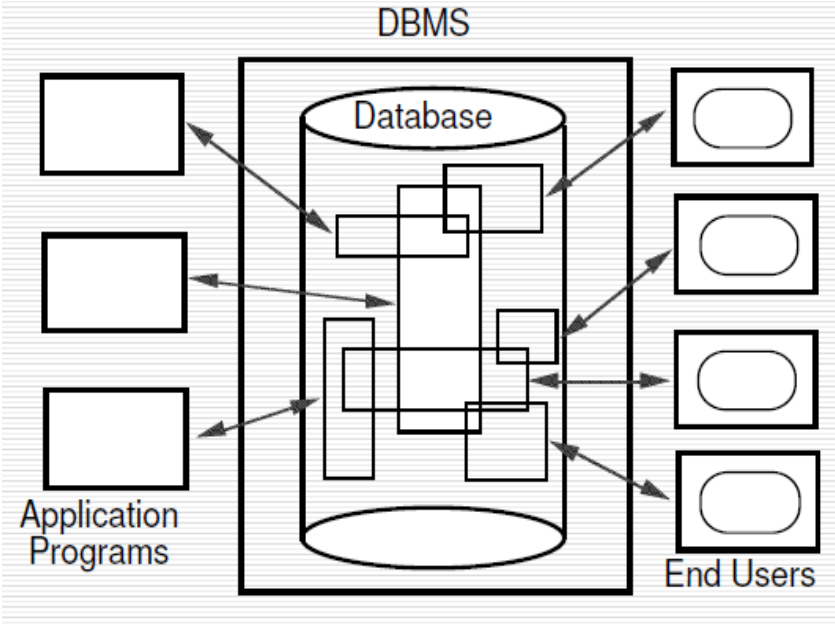

Cooperate Organization Headquarter
States Offices
Decision Support System
DBMS
Corporate Organization Network
Divisions
Sub-divission
Districts

Chapter 21
Database Management System

21.1. Description of Database

Databases are the most appropriate computer tool for storing and reporting the financial information that institutions use. They operate well in an institution that depends on a high volume of information and with historical or time-based information. They can generate complex reports from a large data source. Most importantly, databases create functional information systems. They organize information in a system according to its elements (such as scheduled and actual loan payments) and the relationships among those elements. The database structure maintains these relationships through key variables. As indicated early, managers and practitioners need a basic understanding of database design, so that they can communicate effectively with programmers and system analysts during the design process. They also need to understand the implications and constraints involved in changing the database structure in the future. Databases store information in tables, which are comprised of fields and records. Tables, fields and records are analogous to a simple spreadsheet, in which the data points the user wishes to store are defined in

columns (i.e., fields) and new data is added by the inclusion of new rows (i.e., records). The diagram below illustrates the interaction with database.



21.2. Advantages of Database System

Some of the basic advantages of database are:

1. Sharing of data
2. Enforcement of security
3. Enforcement of development and
4. Maintenance standards
5. Reduction of redundancy

6. Avoidance of inconsistency across files
7. Maintenance of integrity
8. Data independence

21.3. Component of DBMS

Complete Database Management System is made up of the following components

1. Hardware: is the actual computer system used for keeping and accessing the database. Large organization usually has a network with a central server and many client programs running on desktops. Smaller organizations may have the DBMS and its clients reside in a single computer.
2. Software: Examples of DBMS software, Microsoft SQL Server, Oracle Corporation Personal Oracle IBM DB2 etc. The DBMS. Software performs the following functions; allows the users to communicate with the database, Controls access, Includes utilities, Report writers and Application development tools.
3. Data: The database should contain all the data needed by the organization. Emphasis is on the relevant data pertaining to one or more objects or entities. Entity: a thing of significance about which information needs to be known. The characteristics that describe or qualify an entity are called attributes of the entity.
4. Users: The user of DBMS can be any of the following;

i. The database administrator (DBA) is the person or group in charge of implementing the database system within the organization.
ii. The end users are the people who sit at workstations and interact directly with the system.
iii. The application programmers interact with the database by accessing the data from programs written in high-level languages such as Visual Basic etc.

5. Procedures: An integral part of any system is the set of procedures that control the behavior of the system. The actual practices the users follow to obtain, enter, maintain, and retrieve the data. For example, in a payroll system, how are the hours worked received by the clerk and entered into the system? Exactly when are monthly reports generated and to who are they sent?

21.4. Database Design

Designing a database is in fact fairly easy, but there are a few rules to stick to. It is important to know what these rules are, but more importantly is to know why these rules exist, otherwise you will tend to make mistakes. Standardization makes your data model flexible and that makes working with your data much easier.

A good database design starts with a list of the data that you want to include in your database and what you want to be able to do

with the database later on. This can all be written in your own language, without any SQL. In this stage you must try not to think in tables or columns, but just think: "What do I need to know?" Don't take this too lightly, because if you find out later that you forgot something, usually you need to start all over. Adding things to your database is mostly a lot of work.

21.4.1. Identifying Entities

The types of information that are saved in the database are called 'entities'. These entities exist in four kinds: people, things, events, and locations. Everything you could want to put in a database fits into one of these categories. If the information you want to include doesn't fit into these categories, than it is probably not an entity but a property of an entity, an attribute.

In this case we are creating database for a shop. The "Shop" is a location; "Sale" is an event; "Products" are things; and "Customers" are people. These are all entities that need to be included in the database.

But what other things are happening when selling a product? A customer comes into the shop, approaches the vendor, asks a question and gets an answer. "Vendors" also participate, and because vendors are people, we need a vendor's entity.

Entities: Types of information.

21.4.2. Identifying Relationships

The next step is to determine the relationships between the entities and to determine the cardinality of each relationship. The relationship is the connection between the entities, just like in the real world: what does one entity do with the other, how do they relate to each other? For example, customers buy products, products are sold to customers, a sale comprises products, a sale happens in a shop.

The cardinality shows how much of one side of the relationship belongs to how much of the other side of the relationship. First, you need to state for each relationship, how much of one side belongs to exactly 1 of the other side. For example:

How many customers belong to 1 sale?

How many sales belong to 1 customer?

How many sales take place in 1 shop?

You'll get a list like this: (please note that 'product' represents a type of product, not an occurrence of a product)

1. Customers - Sales; 1 customer can buy something several times

2. Sales – Customers; 1 sale is always made by 1 customer at the time
3. Customers – Products; 1 customer can buy multiple products
4. Products – Customers; 1 product can be purchased by multiple customers
5. Customers – Shops; 1 customer can purchase in multiple shops
6. Shops – Customers, 1 shop can receive multiple customers
7. Shops – Products; in 1 shop there are multiple products
8. Products – Shops; 1 product (type) can be sold in multiple shops
9. Shops – Sales; in 1 shop multiple sales can me made
10. Sales – Shops; 1 sale can only be made in 1 shop at the time
11. Products – Sales; 1 product (type) can be purchased in multiple sales
12. Sales – Products; 1 sale can exist out of multiple products

Did we mention all relationships? There are four entities and each entity has a relationship with every other entity, so each entity must have three relationships, and also appear on the left end of the relationship three times. Above, 12 relationships were

mentioned, which is 4*3, so we can conclude that all relationships were mentioned.

Now we'll put the data together to find the cardinality of the whole relationship. In order to do this, we'll draft the cardinalities per relationship. To make this easy to do, we'll adjust the notation a bit, by noting the 'backward'-relationship the other way around:

- Customers - Sales; 1 customer can buy something several times
- Sales - Customers; 1 sale is always made by 1 customer at the time

The second relationship we will turn around so it has the same entity order as the first. Please notice the arrow that is now faced the other way!

- Customers - Sales; 1 sale is always made by 1 customer at the time

Cardinality exists in four types: one-to-one, one-to-many, many-to-one, and many-to-many. In a database design this is indicated as: 1:1, 1:N, M:1, and M:N. To find the right indication just leave the '1'. If there is a 'many' on the left side, this will be indicated with 'M', if there is a 'many' on the right side it is indicated with 'N'.

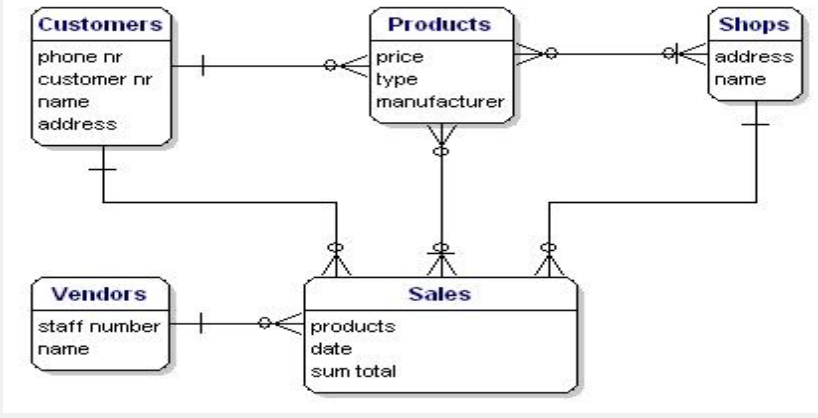
- Customers - Sales; 1 customer can buy something several times; 1:N.
- Customers - Sales; 1 sale is always made by 1 customer at the time; 1:1.

The true cardinality can be calculated through assigning the biggest values for left and right, for which 'N' or 'M' are greater than '1'. In this example, in both cases there is a '1' on the left side. On the right side, there is a 'N' and a '1', the 'N' is the biggest value. The total cardinality is therefore '1:N'. A customer can make multiple 'sales', but each 'sale' has just one customer.

If we do this for the other relationships too, we'll get:

- Customers - Sales; - 1:N
- Customers - Products; - M:N
- Customers - Shops; - M:N
- Sales - Products; - M:N
- Shops - Sales; - 1:N
- Shops - Products; - M:N

So, we have two '1-to-many' relationships, and four 'many-to-many' relationships.



Relationships between the entities.

Between the entities there may be a mutual dependency. This means that the one item cannot exist if the other item does not exist. For example, there cannot be a sale if there are no customers, and there cannot be a sale if there are no products. The relationships Sales --> Customers, and Sales --> Products are mandatory, but the other way around this is not the case. A customer can exist without sale, and also a product can exist without sale. This is of importance for the next step.

Recursive Relationships

Sometimes an entity refers back to itself. For example, think of a work hierarchy: an employee has a boss; and the boss is an employee too. The attribute 'boss' of the entity 'employees' refers back to the entity 'employees'.

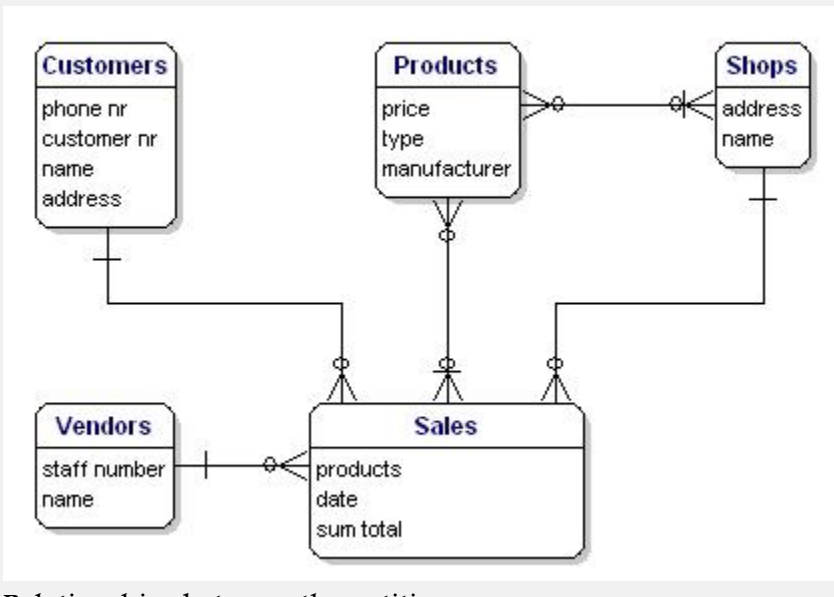
In an ERD this type of relationship is a line that goes out of the entity and returns with a nice loop to the same entity.

Redundant Relationships

Sometimes in your model you will get a 'redundant relationship'. These are relationships that are already indicated by other relationships, although not directly.

In the case of our example there is a direct relationship between customers and products. But there are also relationships from customers to sales and from sales to products, so indirectly there already is a relationship between customers and products

through sales. The relationship 'Customers <----> Products' is made twice, and one of them is therefore redundant. In this case, products are only purchased through a sale, so the relationships 'Customers <----> Products' can be deleted. The model will then look like this:

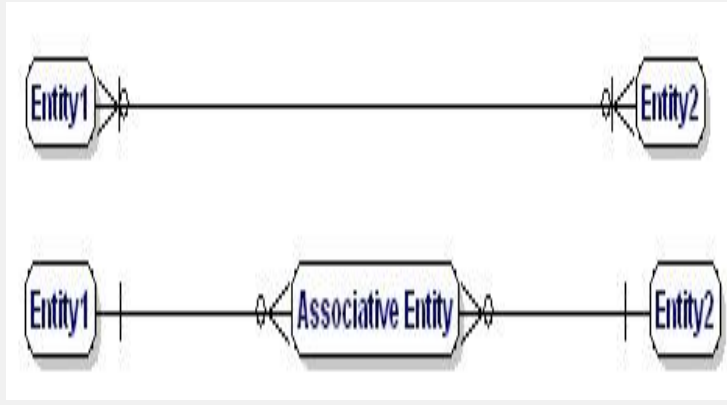


Relationships between the entities.

Solving Many-to-Many Relationships

Many-to-many relationships (M:N) are not directly possible in a database. What a M:N relationship says is that a number of records from one table belongs to a number of records from another table. Somewhere you need to save which records these are and the solution is to split the relationship up in two one-to-many relationships.

This can be done by creating a new entity that is in between the related entities. In our example, there is a many-to-many relationship between sales and products. This can be solved by creating a new entity: sales-products. This entity has a many-to-one relationship with Sales, and a many-to-one relationship with Products. In logical models this is called an associative entity and in physical database terms this is called a link table or junction table.

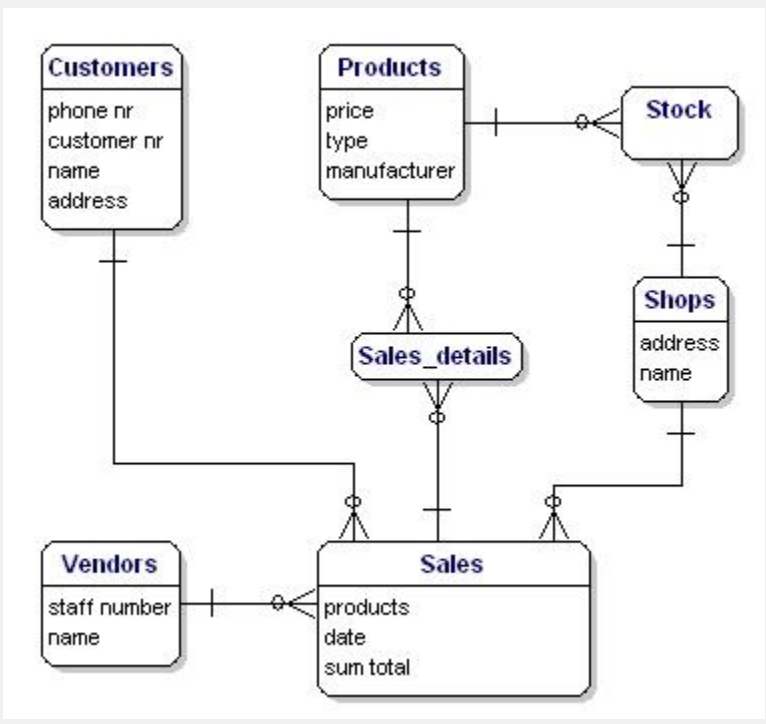


Many to many relationship implementation via associative entity.

In the example there are two many-to-many relationships that need to be solved: 'Products <----> Sales', and 'Products <----> Shops'. For both situations there needs to be created a new entity, but what is that entity?

For the Products <----> Sales relationship, every sale includes more products. The relationship shows the content of the sale. In other words, it gives details about the sale. So the entity is called 'Sales details'. You could also name it 'sold products'.

The Products <----> Shops relationship shows which products are available in which the shops, also known as 'stock'. Our model would now look like this:



Model with link tables Stock and Sales_details.

Identifying Attributes

The data elements that you want to save for each entity are called 'attributes'.

About the products that you sell, you want to know, for example, what the price is, what the name of the manufacturer is, and

what the type number is. About the customers you know their customer number, their name, and address. About the shops you know the location code, the name, the address. Of the sales you know when they happened, in which shop, what products were sold, and the sum total of the sale. Of the vendor you know his staff number, name, and address. What will be included precisely is not of importance yet; it is still only about what you want to save.

Entities with attributes.

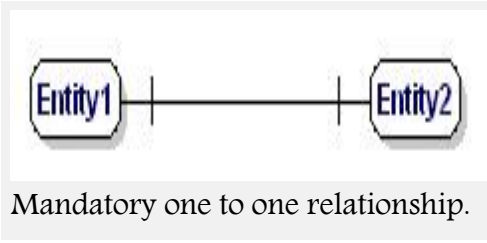
Derived Data

Derived data is data that is derived from the other data that you have already saved. In this case the 'sum total' is a classical case of derived data. You know exactly what has been sold and what each product costs, so you can always calculate how much the

sum total of the sales is. So really it is not necessary to save the sum total. So why is it saved here? Well, because it is a sale, and the price of the product can vary over time. A product can be priced at 10 euros today and at 8 euros next month, and for your administration you need to know what it cost at the time of the sale, and the easiest way to do this is to save it here. There are a lot of more elegant ways, but they are too profound for this article.

Presenting Entities and Relationships: Entity Relationship Diagram (ERD)

The Entity Relationship Diagram (ERD) gives a graphical overview of the database. There are several styles and types of ER Diagrams. A much-used notation is the 'crowfeet' notation, where entities are represented as rectangles and the relationships between the entities are represented as lines between the entities. The signs at the end of the lines indicate the type of relationship. The side of the relationship that is mandatory for the other to exist will be indicated through a dash on the line. Not mandatory entities are indicated through a circle. "Many" is indicated through a 'crowfeet'; de relationship-line splits up in three lines.
In this article we make use of DeZign for Databases to design and present our database.
A 1:1 mandatory relationship is represented as follows:



Mandatory one to one relationship.

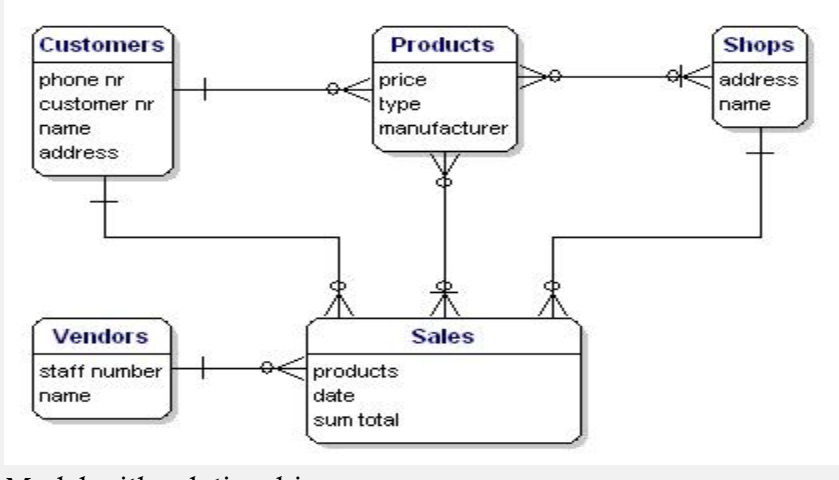
A 1:N mandatory relationship:

Mandatory one to many relationship.

A M:N relationship is:

Mandatory many to many relationship.

The model of our example will look like this:



Model with relationships.

Assigning Keys

Primary Keys

A primary key (PK) is one or more data attributes that uniquely identify an entity. A key that consists of two or more attributes is called a composite key. All attributes part of a primary key must have a value in every record (which cannot be left empty) and the combination of the values within these attributes must be unique in the table.

In the example there are a few obvious candidates for the primary key. Customers all have a customer number, products all have a unique product number and the sales have a sales number. Each of these data is unique and each record will contain a value, so these attributes can be a primary key. Often an integer column is used for the primary key so a record can be easily found through its number.

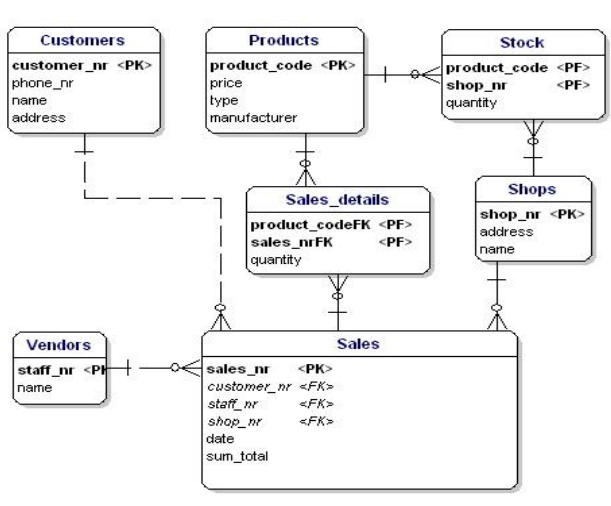
Link-entities usually refer to the primary key attributes of the entities that they link. The primary key of a link-entity is usually a collection of these reference-attributes. For example in the Sales_details entity we could use the combination of the PK's of the sales and products entities as the PK of Sales_details. In this way we enforce that the same product (type) can only be used once in the same sale. Multiple items of the same product type in a sale must be indicated by the quantity.

In the ERD the primary key attributes are indicated by the text 'PK' behind the name of the attribute. In the example only the entity 'shop' does not have an obvious candidate for the PK, so we will introduce a new attribute for that entity: shopnr.

Foreign Keys

The Foreign Key (FK) in an entity is the reference to the primary key of another entity. In the ERD that attribute will be indicated with 'FK' behind its name. The foreign key of an entity can also be part of the primary key, in that case the attribute will be indicated with 'PF' behind its name. This is usually the case with the link-entities, because you usually link two instances only once together (with 1 sale only 1 product type is sold 1 time).

If we put all link-entities, PK's and FK's into the ERD, we get the model as shown below. Please note that the attribute 'products' is no longer necessary in 'Sales', because 'sold products' is now included in the link-table. In the link-table another field was added, 'quantity', that indicates how many products were sold. The quantity field was also added in the stock-table, to indicate how many products are still in store.



Primary keys and foreign keys.

Defining the Attribute's Data Type

Now it is time to figure out which data types need to be used for the attributes. There are a lot of different data types. A few are standardized, but many databases have their own data types that all have their own advantages. Some databases offerthe possibility to define your own data types, in case the standard types cannot do the things you need.

The standard data types that every database knows, and are most-used, are: CHAR, VARCHAR, TEXT, FLOAT, DOUBLE, and INT.

Text:

- CHAR(length) - includes text (characters, numbers, punctuations...). CHAR has as characteristic that it always saves a fixed amount of positions. If you define a

CHAR(10) you can save up to ten positions maximum, but if you only use two positions the database will still save 10 positions. The remaining eight positions will be filled by spaces.

- VARCHAR(length) – includes text (characters, numbers, punctuation...). VARCHAR is the same as CHAR, the difference is that VARCHAR only takes as much space as necessary.
- TEXT – can contain large amounts of text. Depending on the type of database this can add up to gigabytes.

Numbers:

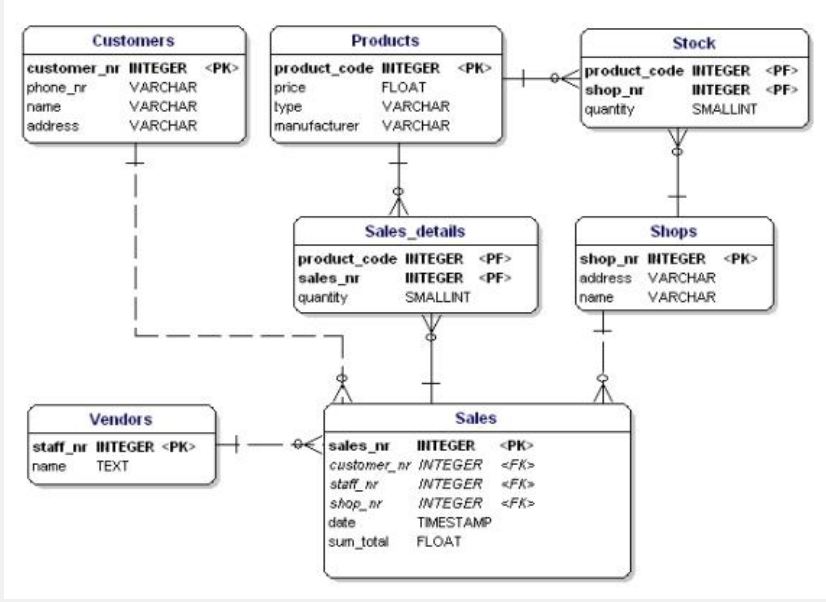
- INT – contains a positive or negative whole number. A lot of databases have variations of the INT, such as TINYINT, SMALLINT, MEDIUMINT, BIGINT, INT2, INT4, INT8. These variations differ from the INT only in the size of the figure that fits into it. A regular INT is 4 bytes (INT4) and fits figures from -2147483647 to +2147483646, or if you define it as UNSIGNED from 0 to 4294967296. The INT8, or BIGINT, can get even bigger in size, from 0 to 18446744073709551616, but takes up to 8 bytes of diskspace, even if there is just a small number in it.
- FLOAT, DOUBLE – The same idea as INT, but can also store floating point numbers. . Do note that this does not always work perfectly. For instance in MySQL calculating with

these floating point numbers is not perfect, (1/3)*3 will result with MySQL's floats in 0.9999999, not 1.

Other types:

- BLOB – for binary data such as files.INET – for IP addresses. Also useable for netmasks.

For our example the data types are as follows:



Data model displaying data types.

Normalization

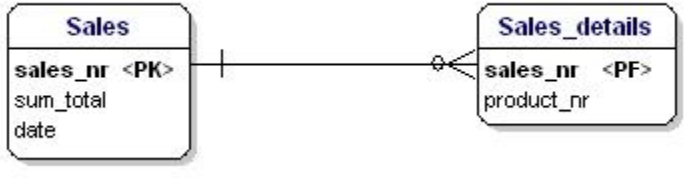
Normalization makes your data model flexible and reliable. It does generate some overhead because you usually get more tables, but it enables you to do many things with your data model without having to adjust it.

Normalization, the First Form

The first form of normalization states that there may be no repeating groups of columns in an entity. We could have created an entity 'sales' with attributes for each of the products that were bought. This would look like this:

Not in 1st normal form.

What is wrong about this is that now only 3 products can be sold. If you would have to sell 4 products, than you would have to start a second sale or adjust your data model by adding 'product4' attributes. Both solutions are unwanted. In these cases you should always create a new entity that you link to the old one via a one-to-many relationship.



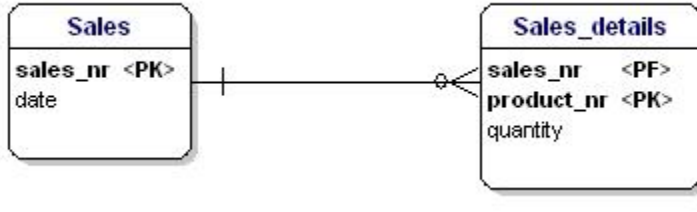
In accordance with 1st normal form.

Normalization, the Second Form

The second form of normalization states that all attributes of an entity should be fully dependent on the whole primary key. This means that each attribute of an entity can only be identified through the whole primary key. Suppose we had the date in the Sales_details entity:

Not in 2nd normal form.

This entity is not according the second normalization form, because in order to be able to look up the date of a sale, I do not have to know what is sold (productnr), the only thing I need to know is the sales number. This was solved by splitting up the tables into the sales and the Sales_details table:



In accordance with 2nd normal form.

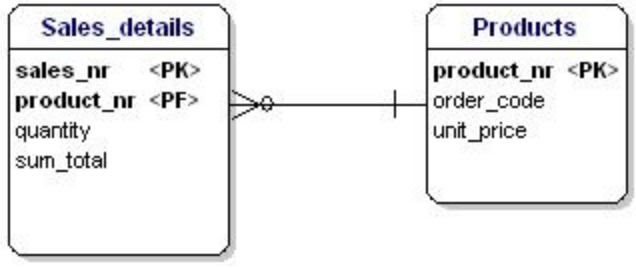
Now each attribute of the entities is dependent on the whole PK of the entity. The date is dependent on the sales number, and the quantity is dependent on the sales number and the sold product.

Normalization, the Third Form

The third form of normalization states that all attributes need to be directly dependent on the primary key, and not on other attributes. This seems to be what the second form of normalization states, but in the second form is actually stated the opposite. In the second form of normalization you point out attributes through the PK, in the third form of normalization every attribute needs to be dependent on the PK, and nothing else.

Not in 3rd normal form.

In this case the price of a loose product is dependent on the ordering number, and the ordering number is dependent on the product number and the sales number. This is not according to the third form of normalization. Again, splitting up the tables solves this.



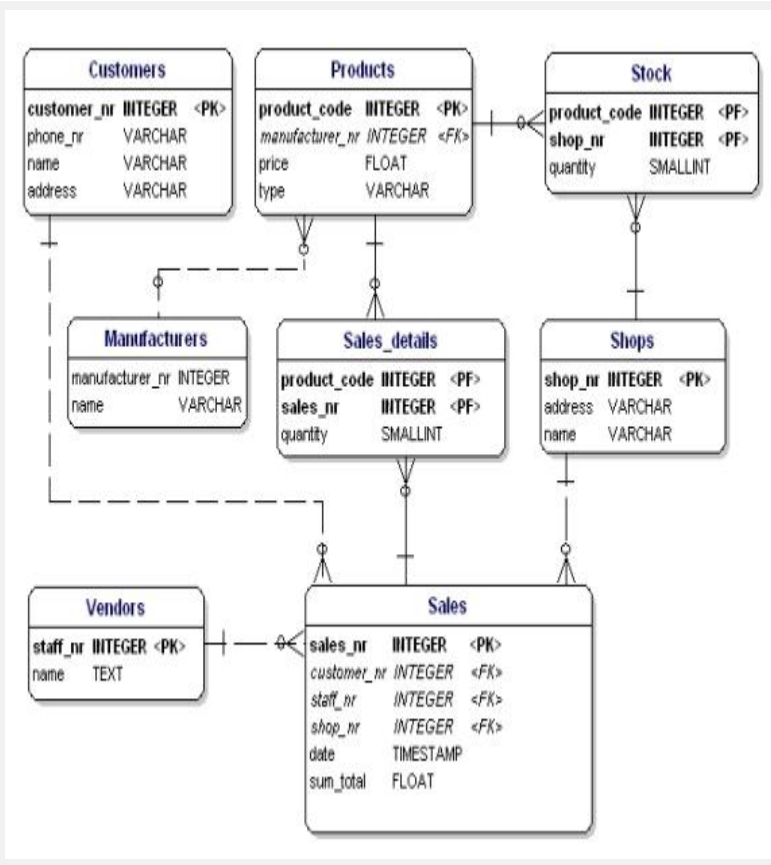
In accordance with 3rd normal form.

Normalization, More Forms

There are more normalization forms than the three forms mentioned above, but those are not of great interest for the average user. These other forms are highly specialized for certain applications. If you stick to the design rules and the normalization mentioned in this article, you will create a design that works great for most applications.

Normalized Data Model

If you apply the normalization rules, you will find that the 'manufacturer' in de product table should also be a separate table:



Data model in accordance with 1st, 2nd and 3d normal form.

Chapter 22
Principles of Project Management

22.1. Definition of Project

Project is a sequence of unique, complex, and connected activities having one goal or purpose and that must be completed by specific time, within budget, and according to specification. A project is a temporary endeavor, having a defined beginning and end (usually constrained by date, but can be by funding or deliverables), undertaken to meet unique goals and objectives, usually to bring about beneficial change or added value.

22.2. Description of Project Management

Project management is the discipline of planning, organizing, and managing resources to bring about the successful completion of specific project goals and objectives. The primary challenge of project management is to achieve all of the project goals and objectives while honoring the preconceived project constraints.

22.3. Processes of Project Development

Traditionally, project management includes a number of elements: four to five process groups, and a control system. Regardless of the methodology or terminology used, the same basic project management processes will be used. Major process groups generally include:

1. Initiation
2. Planning or development
3. Production or execution
4. Monitoring and controlling
5. Closing

22.4. Project Managers

A project manager is a professional in the field of project management. Project managers can have the responsibility of the planning, execution, and closing of any project.. A project manager is the person accountable for accomplishing the stated project objectives. Key project management responsibilities include creating clear and attainable project objectives, building the project requirements, and managing the triple constraint for projects, which is cost, time, and scope.

A project manager is often a client representative and has to determine and implement the exact needs of the client, based on knowledge of the firm they are representing. The ability to adapt to the various internal procedures of the contracting party, and to

form close links with the nominated representatives, is essential in ensuring that the key issues of cost, time, quality and above all, client satisfaction, can be realized.

22.5. Critical Path Method (CPM) & Program Evaluation and Review Technique (PERT) as Project Management Tools

This is a mathematically based algorithm for scheduling a set of project activities. It is an important tool for effective project management. The Critical Path Method (CPM) is a project modeling technique developed in the late 1950s by Morgan R. Walker of DuPont and James E. Kelley, Jr. of Remington Rand. Kelley and Walker related their memories of the development of CPM in 1989. Kelley attributed the term "critical path" to the developers of the Program Evaluation and Review Technique which was developed at about the same time by Booz Allen Hamilton and the US Navy.

CPM is commonly used with all forms of projects, including construction, aerospace and defense, software development, research projects, product development, engineering, and plant maintenance, among others. Any project with interdependent activities can apply this method of mathematical analysis. Although the original CPM program and approach is no longer used, the term is generally applied to any approach used to analyze a project network logic diagram.

Basic Technique in CPM

The essential technique for using CPM is to construct a model of the project that includes the following:

1. A list of all activities required to complete the project (typically categorized within a work breakdown structure),
2. The time (duration) that each activity will take to completion, and
3. The dependencies between the activities

Using these values, CPM calculates the longest path of planned activities to the end of the project, and the earliest and latest that each activity can start and finish without making the project longer. This process determines which activities are "critical" (i.e., on the longest path) and which have "total float" (i.e., can be delayed without making the project longer).

In project management, a **critical path** is the sequence of project network activities which add up to the longest overall duration. This determines the shortest time possible to complete the project. Any delay of an activity on the critical path directly impacts the planned project completion date (i.e. there is no float on the critical path).

A project can have several, parallel, near critical paths. An additional parallel path through the network with the total durations shorter than the critical path is called a sub-critical or non-critical path.

These results allow managers to prioritize activities for the effective management of project completion, and to shorten the planned critical path of a project by pruning critical path activities, by "fast tracking" (i.e., performing more activities in parallel), and/or by "crashing the critical path" (i.e., shortening the durations of critical path activities by adding resources).

22.6. Program Evaluation and Review Technique (PERT)

The Program (or Project) Evaluation and Review Technique, commonly abbreviated PERT, is a model for project management designed to analyze and represent the tasks involved in completing a given project. It is commonly used in conjunction with the critical path method or CPM.

PERT is a method to analyze the involved tasks in completing a given project, especially the time needed to complete each task, and identifying the minimum time needed to complete the total project.

PERT was developed primarily to simplify the planning and scheduling of large and complex projects. PERT is valuable to manage where multiple tasks are going simultaneously to reduce the redundancy.

PERT Terminology

1. PERT event: a point that marks the start or completion of one or more activities. It consumes no time, and uses no

resources. When it marks the completion of one or more tasks, it is not "reached" (does not occur) until all of the activities leading to that event have been completed.

2. Predecessor event: an event that immediately precedes some other event without any other events intervening. An event can have multiple predecessor events and can be the predecessor of multiple events.
3. Successor event: an event that immediately follows some other event without any other intervening events. An event can have multiple successor events and can be the successor of multiple events.
4. PERT activity: the actual performance of a task which consumes time and requires resources (such as labor, materials, space, machinery). It can be understood as representing the time, effort, and resources required to move from one event to another. A PERT activity cannot be performed until the predecessor event has occurred.
5. Optimistic time (O): the minimum possible time required to accomplish a task, assuming everything proceeds better than is normally expected
6. Pessimistic time (P): the maximum possible time required to accomplish a task, assuming everything goes wrong (but excluding major catastrophes).

7. Most likely time (M): the best estimate of the time required to accomplish a task, assuming everything proceeds as normal.
8. Expected time (T_E): the best estimate of the time required to accomplish a task, assuming everything proceeds as normal (the implication being that the expected time is the average time the task would require if the task were repeated on a number of occasions over an extended period of time).

   $T_E = (O + 4M + P) \div 6$
9. Float or Slack is the amount of time that a task in a project network can be delayed without causing a delay – Subsequent tasks – (free float) or Project Completion – (total float)
10. Critical Path: the longest possible continuous pathway taken from the initial event to the terminal event. It determines the total calendar time required for the project; and, therefore, any time delays along the critical path will delay the reaching of the terminal event by at least the same amount.
11. Critical Activity: An activity that has total float equal to zero. Activity with zero float does not mean it is on the critical path.
12. Lead time: the time by which a predecessor event must be completed in order to allow sufficient time for the

activities that must elapse before a specific PERT event reaches completion.

13. Lag time: the earliest time by which a successor event can follow a specific PERT event.
14. Slack: the slack of an event is a measure of the excess time and resources available in achieving this event. Positive slack would indicate ahead of schedule; negative slack would indicate behind schedule; and zero slack would indicate on schedule.
15. Fast tracking: performing more critical activities in parallel
16. Crashing critical path: Shortening duration of critical activities

Advantages of PERT

1. PERT chart explicitly defines and makes visible dependencies (precedence relationships) between the WBS elements
2. PERT facilitates identification of the critical path and makes this visible
3. PERT facilitates identification of early start, late start, and slack for each activity,
4. PERT provides for potentially reduced project duration due to better understanding of dependencies leading to

improved overlapping of activities and tasks where feasible.

5. The large amount of project data can be organized & presented in diagram for use in decision making.

Dis-advantages PERT

1. There can be potentially hundreds or thousands of activities and individual dependency relationships
2. The network charts tend to be large and unwieldy requiring several pages to print and requiring special size paper
3. The lack of a timeframe on most PERT/CPM charts makes it harder to show status although colours can help (e.g., specific colour for completed nodes)
4. When the PERT/CPM charts become unwieldy, they are no longer used to manage the project.

22.7. Project Management Software

Project software is a term covering many types of software, including scheduling, cost control and budget management, resource allocation, collaboration software, communication, quality management and documentation or administration systems, which are used to deal with the complexity of large projects.

Activities of Project management software

Scheduling: One of the most common purposes is to schedule a series of events or tasks and the complexity of the schedule can vary considerably depending on how the tool is used. Some common challenges include:

1. Events which depend on one another in different ways or dependencies
2. Scheduling people to work on, and resources required by, the various tasks commonly termed resource scheduling
3. Dealing with uncertainties in the estimates of the duration of each task

Calculating Critical Path: In many complex schedules, there will be a critical path, or series of events that depend on each other, and whose durations directly determine the length of the whole project. Some software applications (for example, Dependency Structure Matrix solutions) can highlight these tasks, which are often a good candidate for any optimization effort.

Providing Information: Project planning software can be expected to provide information to various people or stakeholders, and can be used to measure and justify the level of effort required to complete the project(s).

Approaches to Project Management Software

Desktop: Project management software can be implemented as a program that runs on the desktop of each user. This typically gives the most responsive and graphically-intense style of interface. Desktop applications typically store their data in a file, although some have the ability to collaborate with other users (see below), or to store their data in a central database. Even a file-based project plan can be shared between users if it's on a networked drive and only one user accesses it at a time. Desktop applications can be written to run in a heterogeneous environment of multiple operating systems, although it's unusual.

Web-based: Project management software can be implemented as a Web application, accessed through an intranet, or an extranet using a web browser. This has all the usual advantages and disadvantages of web applications.

Personal: A personal project management application is one used at home, typically to manage lifestyle or home projects. There is considerable overlap with single user systems, although personal project management software typically involves simpler interfaces. See also non-specialized tools below.

Single user: A single-user system is programmed with the assumption that only one person will ever need to edit the project plan at once. This may be used in small companies or ones where only a few people are involved in top-down project planning. Desktop applications generally fall into this category.

Collaborative: A collaborative system is designed to support multiple users modifying different sections of the plan at once; for example, updating the areas they personally are responsible for such that those estimates get integrated into the overall plan. Web-based tools, including extranets, generally fall into this category, but have the limitation that they can only be used when the user has live Internet access. To address this limitation, some software tools using client–server architecture provide a rich client that runs on users' desktop computer and replicate project and task information to other project team members through a central server when users connect periodically to the network. Some tools allow team members to check out their schedules (and others' as read only) to work on them while not on the network. When reconnecting to the database, all changes are synchronized with the other schedules.

Integrated: An integrated system combines project management or project planning, with many other aspects of company life. For example, projects can have bug tracking issues assigned to each project, the list of project customers becomes a customer relationship management module, and each person on the project plan has their own task lists, calendars, and messaging functionality associated with their projects. Similarly, specialised tools like SourceForge integrate project management software with source control (CVS) software and bug-tracking software, so

that each piece of information can be integrated into the same system.

Issues in Using Project Management Software

The following issues may apply in general, or to specific products, or to some specific functions within products.

1. May not be derived from a sound project management method. For example, displaying the Gantt chart view by default encourages users to focus on timed task scheduling too early, rather than identifying objectives, deliverables and the imposed logical progress of events (dig the trench first to put in the drain pipe).
2. May be inconsistent with the type of project management method. For example, traditional (e.g. Waterfall) vs. agile (e.g. Scrum).
3. Focuses primarily on the planning phase and does not offer enough functionality for project tracking, control and in particular plan-adjustment. There may be excessive dependency on the first paper print-out of a project plan, which is simply a snapshot at one moment in time. The plan is dynamic; as the project progresses the plan must change to accommodate tasks that are completed early, late, re-sequenced, etc. Good management software should not only facilitate this, but assist with impact assessment and communication of plan changes.

4. Does not make a clear distinction between the planning phase and post planning phase, leading to user confusion and frustration when the software does not behave as expected. For example, shortening the duration of a task when an additional human resource is assigned to it while the project is still being planned.
5. Offer complicated features to meet the needs of project management or project scheduling professionals, which must be understood in order to effectively use the product. Additional features may be so complicated as to be of no use to anyone. Complex task prioritization and resource leveling algorithms for example can produce results that make no intuitive sense, and over allocation is often more simply resolved manually.
6. Some people may achieve better results using simpler technique, (e.g. pen and paper), yet feel pressured into using project management software by company policy (discussion).
7. Similar to PowerPoint, project management software might shield the manager from important interpersonal contact.

Chapter 23
Information Security and Control

23.1. Description of Information security

Information Resources need to be guarded, protected and controlled. Information security is the practice of defending information from unauthorized access, use, disclosure, disruption, modification, perusal, inspection, recording or destruction. It is a general term that can be used regardless of the form the data may take (electronic, physical, etc...).

23.2. Typical Terms in Information Security

Below are the typical terms you will hear when dealing with information security.

1. Confidentiality: Confidentiality refers to preventing the disclosure of information to unauthorized individuals or systems. For example, a credit card transaction on the Internet requires the credit card number to be transmitted from the buyer to the merchant and from the merchant to a transaction processing network. The system attempts to enforce confidentiality by encrypting the card number during transmission, by limiting the places where it might

appear (in databases, log files, backups, printed receipts, and so on), and by restricting access to the places where it is stored. If an unauthorized party obtains the card number in any way, a breach of confidentiality has occurred. Confidentiality is necessary (but not sufficient) for maintaining the privacy of the people whose personal information a system holds.[citation needed]

2. Integrity: In information security, data integrity means maintaining and assuring the accuracy and consistency of data over its entire life-cycle. [6] This means that data cannot be modified unauthorized or undetected. This is not the same thing as referential integrity in databases, although it can be viewed as a special case of Consistency as understood in the classic ACID model of transaction processing. Integrity is violated when a message is actively modified in transit. Information security systems typically provide message integrity in addition to data confidentiality.

3. Availability: For any information system to serve its purpose, the information must be available when it is needed. This means that the computing systems used to store and process the information, the security controls used to protect it, and the communication channels used to access it must be functioning correctly. High availability systems aim to remain available at all times, preventing

service disruptions due to power outages, hardware failures, and system upgrades. Ensuring availability also involves preventing denial-of-service attacks.

4. Authenticity: In computing, e-Business, and information security, it is necessary to ensure that the data, transactions, communications or documents (electronic or physical) are genuine. It is also important for authenticity to validate that both parties involved are who they claim to be.

5. Non-repudiation: In law, non-repudiation implies one's intention to fulfill their obligations to a contract. It also implies that one party of a transaction cannot deny having received a transaction nor can the other party deny having sent a transaction. Electronic commerce uses technology such as digital signatures and public key encryption to establish authenticity and non-repudiation.

23.3. Security Classification for Information

An important aspect of information security and risk management is recognizing the value of information and defining appropriate procedures and protection requirements for the information. Not all information is equal and so not all information requires the same degree of protection. This requires information to be assigned a security classification. There aresteps in information classification.

- The first step in information classification is to identify a member of senior management as the owner of the particular information to be classified.
- Next, develop a classification policy.
- The policy should describe the different classification labels; define the criteria for information to be assigned a particular label. For example In the business sector, labels such as: Public, Sensitive, Private, and Confidential. In the government sector, labels such as: Unclassified, Sensitive But Unclassified, Restricted, Confidential, Secret, Top Secret and their non-English equivalents. In cross-sectoral formations, the Traffic Light Protocol, which consists of: White, Green, Amber, and Red.?
- List the required security controls for each classification.

Note: All employees in the organization, as well as business partners, must be trained on the classification schema and understand the required security controls and handling procedures for each classification. The classification of a particular information asset has been assigned should be reviewed periodically to ensure the classification is still appropriate for the information and to ensure the security controls required by the classification are in place.

Factors That Influence Classification Information

Some factors that influence which classification information should be assigned include.

- How much value that information has to the organization.
- How old the information is
- How relevant is the information i.e. whether or not the information has become obsolete.
- Laws and other regulatory requirements are also important considerations when classifying information.

23.4. Data Security Threats to Information System

The data security threat of information system is described as follows.

- **Technical Data Security Threats to Information Systems**

1. Non-existent Security Architecture. Some organizations do not have established security architecture in place, leaving their networks vulnerable to exploitation and the loss of personally identifiable information (PII). At times, due to a lack of resources or qualified IT staff, organizations' networks are connected to the internet directly, or are connected using out-of-the-box network appliances with default configurations attached, with no additional layer of protection. It is important to note that having a firewall alone is not sufficient to ensure the safety of a network.

Inadequate network protection results in increased vulnerability of the data, hardware, and software, including susceptibility to malicious software (malware), viruses, and hacking. If the network contains sensitive information or PII, such as students' social security numbers, it is critical that even in a very limited resource environment, minimal user, network and perimeter security protection mechanisms (such as anti-virus) are implemented, including making sure that anti-virus software is properly configured. Robust security architecture is essential and provides a roadmap to implementing necessary data protection measures.

2. Un-patched Client Side Software and Applications. Computers run a variety of software applications, including older versions of that may sometimes contain vulnerabilities that can be exploited by malicious actors. Keeping up with software updates and upgrades, in addition to applying manufacturer-recommended patches, minimizes many of the vulnerabilities.
3. "Phishing" and Targeted Attacks ("Spear Phishing"). One way malicious individuals or criminals (e.g., hackers) target individuals and organizations to gain access to personal information is through emails containing malicious code—this is referred to as phishing. Once

infected emails are opened, the user's machine can be compromised.

4. Internet Web sites. Malicious code can be transferred to a computer through browsing webpages that have not undergone security updates. Therefore, simply browsing the internet and visiting compromised or unsecured websites could result in malicious software being downloaded to an organization's computers and network.
5. Poor Configuration Management. Any computer connected to the network, whether at work or at home, that does not follow configuration management policy, is vulnerable to an attack. Weak data security protection measures that do not restrict which machines can connect to the organization's network make it vulnerable to this type of threat.
6. Mobile Devices. Use of mobile devices, such as laptops or handheld devices, including smartphones, is exploding; however, the ability to secure them is lagging behind. The situation is complicated by the fact that these devices are often used to conduct work outside the organization's regular network security boundaries. Data breaches can occur in a number of ways: devices can be lost, stolen, or their security can be compromised by malicious code invading the operating system and applications.

7. Cloud Computing. Delegating the bulk of data protection services to a third party shifts enterprise security architecture. In cloud computing, for example, large amounts of customer data are stored in shared resources, which raise a variety of data encryption and availability issues. Further, the cloud provider faces the same data security responsibilities and challenges as the organization that owns the data, including patching and managing their applications against malicious code.
8. Removable media. The use of removable media (e.g., flash drives, CDs, and external hard drives) on an organization's network poses a significant security threat. Without proper protection, these types of media provide a pathway for malware to move between networks or hosts. Following proper security measures when using removable media devices is necessary to decrease the risk of infecting organization's machines or the entire network.
9. Botnets. Botnets are networks of compromised computers used by hackers for malicious purposes, usually criminal in nature. If it is discovered that an organization's network has been infected, it is organization's responsibility to notify stakeholders about a potential compromise of all data residing on the network, regardless of whether the data themselves were the target. Clean up efforts resulting

from botnet infestation may be costly and damaging to an organization's reputation.

10. Zero-day Attacks. A zero-day attack is a threat aimed at exploiting software application vulnerability before the application vendor becomes aware of it and before the vulnerability becomes widely known to the internet security community. These attacks are among the hardest to mitigate and leave computers and networks extremely vulnerable.

- **Non-Technical Cyber Security Threats to Information Systems**

1. Insider. An insider is defined as someone with legitimate access to the network. Because information accessed by insiders can be easily stolen, copied, deleted, misfiled, or changed, insider threats can be some of the most damaging, regardless of whether they occur due to user carelessness or malicious attempts.
2. Poor Passwords. Implementing a policy on strong user passwords is critical to data protection. It is especially important for users with access to the most sensitive information. Modern password-cracking programs can easily break weak passwords, such as those containing common words or word groups found in a dictionary. For this reason, user-selected passwords are generally

considered to be weaker than randomly-generated passwords. User-generated passwords often follow a predictable pattern or association to something in the user's life (city, family, or pet names for example) and are therefore more vulnerable to password-cracking programs. While randomly-generated passwords may be harder to remember, they are relatively more secure.

3. Physical Security. Physical security is essential to preventing unauthorized access to sensitive data as well as protecting an organization's personnel and resources. An effective physical security system is an integral part of a comprehensive security program. Physical safety measures include securing access to dedicated computers, server rooms, routers, printers, and any areas that process or store sensitive data.
4. Insufficient Backup and Recovery. Lack of a robust data backup and recovery solution puts an organization's data at risk and undermines the effectiveness of its IT operations. Data and system recovery capabilities allow an organization to reduce the risk of damage associated with a data breach. It is essential to conduct routine backups of critical data and store backup media in a safe and secure manner.
5. Improper Destruction. Paper documents, such as reports and catalogs, may contain sensitive data. Unless these

documents are destroyed properly (for example, by shredding or incinerating), they may be salvaged and misused. Discarded electronic devices, such as computers or portable drives, that has been used in processing and storing sensitive data, remains vulnerable unless the data are erased properly. A data breach can occur if recovery tools are used to extract improperly erased or overwritten data.

6. Social Media. Using organization's devices and network resources to access social media websites poses a high data security threat. Social networking sites are often targeted by malware, receive a high degree of spam, and are frequently used to gain information for identity theft.
7. Social Engineering. Breaking into a network does not require technical skills. Access to sensitive information can be gained by manipulating legitimate users after securing their trust. Caution should be advised when communicating any account or network information. This involves making sure the requester is well-known to the user and has a legitimate reason for this information. Socially engineered attacks are the means for some hackers to gain passwords, access codes, IP addresses, router or server names, and other information that can be exploited to break into a network.

Questions

1. Explain briefly Project Management
2. Describe the term CPM and list the essential techniques for using CPM.
3. Criticize project management software as it may apply to general, or specific products, or to some specific functions within products.
4. Describe any 5 Activities of Project Management Software.
5. What is PERT, give any 4 advantages 4 disadvantages of PERT.
6. Justify the needs for integration of Business Processes & Information systems
7. Explain briefly the differences and relationship between Information Systems and Information Technology
8. Discuss the need for IS & IT strategy in an Organization
9. Discuss any 5 components of Management Information System you know.
10. Juxtapose the statement. Data is information and Information is data
11. Describe some features of Data/Information
12. Explain Sources of Data/Information
13. Documents for data capture can be divided into 3 groups. List and explain them.
14. Discuss various Techniques of capturing Data.
15. Explain with aid of diagram the stages involve in TPS

16. Define Control as related to TPS and highlights 4 major function of control.
17. Discus the 3 basic characteristics of Strategic Information System
18. Write briefly on the evolution of MIS
19. What are the impact of MIS on organization
20. Discuss the phases MIS development
21. Explain the term decision making in an organization, hence summarize major differences between problem analysis and decision making.
22. Explain the Decision making Techniques you know
23. Describe the term Decision Table
24. What does Scope of feasibility study entail?
25. Explain the term "Steering Committee" and summarize the function/task of steering committee.
26. Discuss 4 means of accessing Project Feasibility.
27. Discuss the 3 activities involved in System Investigation.
28. Define Facts finding and highlight 5 facts finding methods
29. What are the objectives of system design?
30. Describe various activities involved in System Design.
31. Discuss the activities involved in System Implementation.
32. What are the objectives of System Design
33. Write short note on different form of change-over you know.
34. Describe any 3 type of System Maintenance you know.

35. Highlight any 5 factors responsible for successful IT project implementation.
36. Discuss in detail what needs to be put in place for effective maintenance and operation of the system towards efficiency and cost reduction.
37. What are the phases of SDLC, System Development Life Cycle?
38. Justify the relevant of Information in decision Making

Multiple Choice Questions

1. The type of information used by senior management in the formulation of long-term policies is known as _____.
2. _____ is the arrangement or rearrangement of data items in a particular order.
3. Computer programs that allow users to benefit from expert knowledge and information are called _____.
4. _____ is a system to convert data from internal and external sources into information and convey same to managers for decision-making.
5. _____ is the processing, as a group, of a number of transactions of a similar kind, which have been entered over a period to a computer system.
6. When a computer system provides for the immediate updating of its data files by input from users so that any

subsequent user has access to the updated file, the system is said to operate in _____.

7. The speed of computer is measured in _____.
8. The transmission speed of a communication line is known as _____.
9. _____ is the agreed set of procedures/rules in communication system.
10. _____ is an interface device between two networks of different types.
11. A system is _____.
12. _____ is a system in which the output cannot be predicted with certainty for a given set of inputs, except it is based on probabilities of various different outputs happening.
13. _____ is information which indicates that the system is deviating from its planned or prescribed course, and that some re-adjustment is necessary to bring it back on course.
14. _____ is the deliberate inducement of a user or a resource to take an incorrect action.
15. _____ is a theft of small amounts of assets (primarily money) from a number of sources.
16. A _____ is a program that while visibly performing one function secretly carries out another.

17. _____ is the protection of data from accidental or deliberate threats and the protection of an information system from natural and man-made disasters.
18. The right of an individual to control the use of information about him/her is _____.
19. _____ is the use of computer and communications technology to conduct meetings in which several participants, in different locations, are linked up via computer and a video.
20. The economic feasibility study is measured by _____ analysis.
21. In any system evaluation, the terms which always reoccur are _____ and effectiveness.
22. The name given to a model of a system to show users early in the design process how it will finally appear is _____.
23. There are four key areas in which a project must be feasible if it is to be selected. They are technical feasibility, economic feasibility, _____ and _____.
24. _____ is the method of changeover in which the system is completely replaced by the new.
25. _____ includes a wide range of technical and non-technical books, manuals, descriptions and diagrams relating to the use and operation of a computer system.
26. _____ maintenance is carried when there is system failures.

27. _____ means changing existing files into a format suitable for the new system.
28. A collection of procedures, techniques, tools and documentation aids which will help systems developers in their efforts to develop a new system is called _____.
29. The procedure or method of using questionnaire, interview, observation, and documentation in system investigation is generally termed _____.
30. Just as we have guards at country borders, checking passports, companies now employ the design of _____ to protect their private networks.
31. _____undertake all tasks relating to management reporting of labour and material costing, allocation of overhead expenditure, job and process costing, cost-volume-profit analysis, budgeting, variance analysis, capital investment decisions and organisation controls.
32. _____ refers to a powerful collection of elements which include computer hardware, software, telecommunication networks, workstations, robotics and smart chips.
33. The issue of what should an organization do with the technology is termed_____
34. _____ is an era of MIS that is dominated by information systems that have as their primary function the

processing of predefined (business) transactions to produce fixed-format reports on schedule.

35. The systems that are used to support or shape the competitive strategy of the organisation: its plan for gaining or maintaining competitive advantage or reducing the advantage of its competitors is _____
36. Which h of the 2 forces that drvies technology has emerged because markets are becoming highly competitive and the traditional sources of competitive advantages are diminishing as competitors strive to attain parity with one another_____
37. _____ is 'an economic community supported by a foundation of interacting organisations and individuals
38. _____Analysis is used to identify potential sources of economic advantage.
39. _____ is a disruptive technology and has serious implications for the way that organizations manage their day-to-day operations and also for their staff and the overall organizational business model.
40. _____involves working across multiple enterprises or companies (Inter-enterprise) to shorten the supply chain time in the delivery of goods and services to the consumer or customer.

Answer to Multiple Choice Questions

1. Strategic information
2. Sorting
3. Expert systems
4. Management Information System [MIS]
5. Batch processing
6. Real time
7. Hertz
8. Baud rate
9. Protocol
10. Gateway
11. A system is a group of related elements or activities that are organized for a specific purpose or to achieve a common objective.
12. Stochastic / Probabilistic System
13. Negative feedback
14. Spoofing
15. Salami technique
16. Trojan Horse
17. Security
18. Privacy
19. Video conferencing
20. Cost-benefit
21. Efficiency
22. Prototype
23. Operational Feasibility and Social Feasibility
24. Direct changeover
25. Documentation
26. Corrective
27. File conversion
28. System Development Methodology
29. Fact-finding
30. Firewalls
31. Management ACCOUNTING
32. Information technology (IT)
33. IS strategy
34. Data processing (DP) era
35. Strategic Information Systems (SIS)
36. Technology push
37. Virtual Market Ecosystem
38. Value Chain
39. E-business
40. Supply Chain Analysis

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