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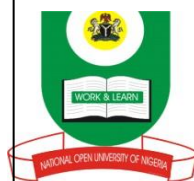
COURSE CODE: CIT 364

COURSE TITLE: MANAGEMENT INFORMATION SYSTEMS

COURSE GUIDE

**CIT 364
MANAGEMENT INFORMATION SYSTEM**

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INTRODUCTION

CIT 364: Management Information System is a 2 - credit unit course for students pursuing Bachelor of Science degree in Computer Science and other related disciplines.

The course is divided into 3 modules and 10 study units. It discusses the different stages involved in developing good and functional information technology, different ways of information representations and information storage media.

This course guide therefore gives you an overview of what the course: CIT 364 is all about, the textbooks and other materials to be referenced, what you expect to know in each unit, and how to work through the course material.

WHAT YOU WILL LEARN IN THIS COURSE

The overall aim of this course is to introduce you to basic concepts of management information system to enable you understand the basic elements of management involves in every organisation. This course highlights and enumerates modern technologies that transform the society into the global village as far as information dissemination is concerned. You will be put through the definitions of common terms in relation to management information system, the characteristics of information, internet and its usage, the different management levels, and lastly, numerous ways of information representation and storage media.

COURSE AIM

This course aims at introducing you to the basic concepts and features of management information system. It is believed that the knowledge will boost your capacity and enable you to perform effectively in your career.

COURSE OBJECTIVES

It is important to note that each unit has specific objectives. You should study them carefully before proceeding to subsequent units. Therefore, it may be useful to refer to these objectives in the course of your study of the unit to assess your progress. You should always look at the unit objectives after completing a unit. In this way, you can be sure that you have done what is required of you at the end of the unit.
However, below are overall objectives of this course. On completing this course, you should be able to:

- define what Management Information System is all about
- explain the meaning of management
- define the meaning of information
- list characteristics of information
- list the advantages of MIS
- enumerate the values of information
- state the goals of MIS
- pinpoint problems of MIS
- discuss the levels of management
- discuss types of MIS
- give an overview of Information Technology
- state reasons for Information Technology
- state the technologies for Information System
- state the ethics of Information Technology
- state the application of Information Technology
- discuss the origin of the Internet
- list the requirements for Internet connectivity
- explain the information format on the Internet
- list the limitation of the Internet
- state different ways of information representation in computer system
- discuss storage media in computer.

WORKING THROUGH THIS COURSE

To complete this course, you are required to study all the units, the recommended textbooks, and other relevant materials. Each unit contains some self-assessment exercises and tutor-marked assignments, and at some point in this course, you are required to submit the tutor-marked assignments. There is also a final examination at the end of this course. Stated below are the components of this course and what you have to do.

COURSE MATERIALS

The major components of the course are:

1.   Course Guide
2.   Study Units
3.   Textbooks and References
4.   Assignment File
5.   Presentation Schedule

STUDY UNITS

There are 10 study units and 3 modules in this course. They are:

Module 1   Management Information Fundamentals

Unit 1   Introduction to MIS
Unit 2   Types of MIS
Unit 3   Levels of Management

Module 2   Information Technology

Unit 1   Overview of Information Technology
Unit 2   Technologies for Information System
Unit 3   Internet
Unit 4   Modes of Information Communication

Module 3   Information Representation, Storage and Security

Unit 1   Information Representation
Unit 2   Information Storage Media
Unit 3   Information Security

TEXTBOOKS AND REFERENCES

These texts will be of enormous benefit to you in this course:

Agbasi, K.C. (1993). *Computer Appreciation*: *An Individual Computer to Systems* . Enugu: ACENA Publishers.

Ahituv, N.; Neumann, S. & Riley, H. N. (1994). *Principles of Information Systems for Management.* (4th ed.). Dubuque, IA: Wm. C. Brown Communications.

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Banerjee, U. K. & Sachdeva, R. K. (1995). *Management Information System: A New Frame Work.* New Delhi: Vikas Publishing House.

Christensen, C. M. (1997). *The Innovator's Dilemma.* New York: Harper Business. p. 19. ISBN 0-06-662069-4.

Chandler, D. (September 26, 1988). "Start up Ships 2.5-Inch Hard Disk Aimed for Portables, Laptops". *PC Week*: 6.

Davis, G. B. & Olson, M. H. (1985). *Management Information Systems: Conceptual Foundations, Structure, and Development.* New York: McGraw-Hill.

Imboden, N. (1980). *Managing Information for Rural Development Projects.* Paris: Organisation for Economic Co-operation and Development.

Inyiama, H. C. (2000). *Understanding Computers.* 15A Bank Avenue, Aguowa, Trans-Ekulu, Enugu, Nigeria: The Dynamic Informer.

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Lee, A. S. (2001). "Editor's Comments". *MIS Quarterly* **25** (1): iii-vii.

Livinus, C. N. (2003). *Internet Literacy.* Enugu, Nigeria: Horizon Publications.

Lucas, H. C. Jr. (1990). *Information Systems Concepts for Management.* New York: McGraw-Hill.

Martin, J. (1990). *Telecommunications and the Computer.* (3rd ed.). Englewood Cliffs, NJ: Prentice-Hall.

Mason, R. D. & Swanson, B. E. (1981). *Measurements for Management Decision.* Reading, MA: Addison-Wesley.

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McLeod, R., Jr. (1995). *Management Information Systems*: *A Study of Computer-Based Information Systems.* (6th ed.). New Delhi: Prentice Hall of India.

Nwafor, C. E. (2005). *Computer and Internet Literacy*. Enugu: Joans Publishers.

Nwafor, C. E. (2006). *Computer and Information Technology Literacy*. Dynamic Informer.

O'Brien, J. (1999). *Management Information Systems*: *Managing Information Technology in the Internetworked Enterprise*. Boston: Irwin McGraw-Hill. ISBN 0071123733.

Osmond, V. (2009). *Characteristics of a good Management Information System.* Online @ http://www.ehow.com, visited on 22nd September, 2010.

Ramesh, A.; Singh, Y. & Sachdeva R. (2008). *Establishing a Management Information System.* Online @ http://www.fao.org, visited on 22nd September, 2010.

Richard, W. & Teffrey M. (1986). *Using Computer in an Information Age*. Delmar Publisher.

Schmid, Patrick & Achim Roos (2010-05-08). "3.5" Vs. 2.5" SAS HDDs: In Storage, Size Matters". Tomshardware.com. http://www.tomshardware.co.uk/enterprise-storage-sas-hdd,review-31891.html. Retrieved 2010-06-25.

Terry, L. (1997). *Management Information Systems*. Hampshire, USA: Ashford Colour Press, Gosport.

Williams, K. B. (1999). *Using Information Technology.* United States: Irwin/McGraw-Hill.

ASSIGNMENT FILE

The assignment file will be given to you in due course. In this file, you will find all the details of the work you must submit to your tutor for marking. The marks you obtain for these assignments will count towards the final mark for the course. Altogether, there are 15 tutor-marked assignments for this course.

PRESENTATION SCHEDULE

The presentation schedule included in this course guide provides you with important dates for completion of each tutor-marked assignment. You should therefore endeavour to meet the deadlines.

ASSESSMENT

There are two aspects to the assessment of this course. First, there are tutor-marked assignments; and second, the written examination. Therefore, you are expected to take note of the facts, information and problem solving gathered during the course. The tutor-marked assignments must be submitted to your tutor for formal assessment, in accordance with the deadline given. The work submitted will count for 30% of your total course mark. At the end of the course, you will need to sit for a final written examination. This examination will account for 70% of your total score.

TUTOR-MARKED ASSIGNMENT

There are 10 tutor-marked assignments (TMAs) in this course. You need to submit all the TMAs. The best 3 will therefore be counted. When you have completed each assignment, send them to your tutor as soon as possible and ensure that it gets to your tutor on or before the stipulated deadline. If for any reason you cannot complete your assignment on time, contact your tutor before the assignment is due to discuss the possibility of extension. Extension will not be granted after the deadline, unless on extraordinary cases.

FINAL EXAMINATION AND GRADING

The final examination for CIT364 will last for a period of 2 hours and have a value of 70% of the total course grade. The examination will consist of questions which reflect the self-assessment exercise and tutor-marked assignments that you have previously encountered. Furthermore,

all areas of the course will be examined. It would be better to use the time between finishing the last unit and sitting for the examination to revise the entire course. You might find it useful to review your TMAs and comments on them before the examination. The final examination covers information from all parts of the course.

COURSE MARKING SCHEME

The following table shows the course marking scheme.

Table 1:   Course Marking Scheme

Assessment	Marks
Assignments	Four assignments, 30% for the best 3 Total = 10% x 3 = 30%
Final Examination	70% of overall course marks
Total	100% of Course Marks

COURSE OVERVIEW

This table indicates the units, the number of weeks required to complete them and the assignments.

Table 2:   Course Organiser

Unit	Title of the work	Weekly Activity	Assessment (End of Unit)
	Course Guide		
Module 1 Management Information System Fundamentals			
1	Introduction	Week 1	Assessment 1
2	Types of MIS	Week 2	Assessment 2
3	Levels of Management	Week3	Assessment 3
Module 2 Information Technology			
1	Overview of Information Technology	Week 4	Assessment 4
2	Technologies for Information System	Week 5	Assessment 5
3	Internet	Week 6	Assessment 6
4	Modes Information Communication	Week 7	Assessment 7
Module 3 Information Representation, Storage and Security			
1	Information Representation	Week 8	Assessment 8
2	Information Storage	Week 9	Assessment 9
3	Information Security	Week 10	Assessment 10

HOW TO GET THE MOST OUT OF THIS COURSE

In distance learning, the study units replace the university lecturer. This is one of the huge advantages of distance learning mode; you can read and work through specially designed study materials at your own pace and at a time and place that is most convenient. Think of it as reading from the teacher, the study guide indicates what you ought to study, how to study it and the relevant texts to consult. You are provided with exercises at appropriate points, just as a lecturer might give you an in-class exercise.

Each of the study units follows a common format. The first item is an introduction to the subject matter of the unit and how a particular unit is integrated with the other units and the course as a whole. Next to this is a set of learning objectives. These learning objectives are meant to guide your studies. The moment a unit is finished, you must go back and check whether you have achieved the objectives. If this is made a habit, then you will increase your chances of passing the course. The main body of the units also guides you through the required readings from other sources. This will usually be either from a set book or from other sources. Self-assessment exercises are provided throughout the unit, to aid personal studies. Working through these self-tests will help you to achieve the objectives of the unit and also prepare you for tutor-marked assignments and examinations. You should attempt each self test as you encounter them in the units.

The following are practical strategies for working through this course:

1.   Read the course guide thoroughly.
2.   Organise a study schedule. Refer to the course overview for more details. Note the time you are expected to spend on each unit and how the assignment relates to the units. Important details, e.g. details of your tutorials and the date of the first day of the semester are available. You need to gather together all these information in one place such as a diary, a wall chart calendar or an organiser. Whatever method you choose, you should decide on and write in your own dates for working on each unit.
3.   Once you have created your own study schedule, do everything you can to stick to it. The major reason that students fail is that they get behind with their course works. If you get into difficulties with your schedule, please let your tutor know before it is too late for help.

4.   Turn to Unit 1 and read the introduction and the objectives for the unit.

5.   Assemble the study materials. Information about what you need for a unit is given in the table of content at the beginning of each unit. You will almost always need both the study unit you are working on and one of the materials recommended for further readings on your desk at the same time.

6.   Work through the unit, the content of the unit itself has been arranged to provide a sequence for you to follow. As you work through the unit, you will be encouraged to read from your set books.

7.   Keep in mind that you will learn a lot by doing all your assignments carefully. They have been designed to help you meet the objectives of the course and will help you pass the examination.

8.   Review the objectives of each study unit to confirm that you have achieved them. If you are not certain about any of the objectives, review the study material and consult your tutor.

9.   When you are confident that you have achieved a unit's objectives, you can start on the next unit. Proceed unit by unit through the course and try to pace your study so that you can keep yourself on schedule.

10. When you have submitted an assignment to your tutor for marking, do not wait for its return before starting on the next unit. Keep to your schedule. When the assignment is returned, pay particular attention to your tutor's comments, both on the tutor-marked assignment form and also written on the assignment. Consult you tutor as soon as possible if you have any questions or problems.

11. After completing the last unit, review the course and prepare yourself for the final examination. Check that you have achieved the unit objectives (listed at the beginning of each unit) and the course objectives (listed in this course guide).

FACILITATORS/TUTORS AND TUTORIALS

There are eight hours of tutorial provided in support of this course. You will be notified of the dates, time and location together with the name and phone number of your tutor as soon as you are allocated a tutorial group. Your tutor will mark and comment on your assignments, keep a close watch on your progress and on any difficulties you might encounter and provide assistance to you during the course. You must send your tutor-marked assignment to your tutor well before the due date. At least two working days are required for this purpose. They will be marked by your tutor and returned to you as soon as possible. Do not

hesitate to contact your tutor by telephone, e-mail or discussion board if you need help. The following might be circumstances in which you would find help necessary: contact your tutor if:

- you do not understand any part of the study units or the assigned readings.
- you have difficulty with the self test or exercise
- you have questions or problems with an assignment, with your tutor's comments on an assignment or with the grading of an assignment.

You should endeavour to attend the tutorials. This is the only opportunity to have face-to-face contact with your tutor and ask questions which are answered instantly. You can raise any problem encountered in the course of your study. To gain the maximum benefit from the course tutorials, have some questions handy before attending them. You will learn a lot from participating actively in discussions.

GOODLUCK!

MAIN COURSE

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MODULE 1   MANAGEMENT INFORMATION SYSTEM FUNDAMENTALS

Unit 1   Introduction to Management Information System
Unit 2   Types of Management Information System
Unit 3   Levels of Management

UNIT 1   INTRODUCTION TO MANAGEMENT INFORMATION SYSTEM (MIS)

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2.0   Objectives
3.0   Main Content
      3.1   Definition of MIS
      3.2   Goals of MIS
      3.3   Characteristics
      3.4   Advantages of MIS
      3.5   Problems of MIS
      3.6   Components of MIS
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            3.6.2 Information
            3.6.3 Instruction
            3.6.4 Relationship between Data, Information and Instruction
            3.6.5 Database
            3.6.6 Decision Support Systems
            3.6.7 Hardware/Software
            3.6.8 Application
      3.7   Value of MIS
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Reading

1.0   INTRODUCTION

As levels of information needed for day to day activities increases, more data are being stored and linked; man began to analyse this information bringing further detail, creating entire management reports from the raw, stored data.

This unit presents the meaning of MIS, its goals, characteristics, advantages and the general concepts one needs to know about MIS. Because the constituents of MIS are common terms used on daily bases in industries, offices, understanding of every concept is as easy as the terms themselves.

2.0   OBJECTIVES

At the end of this unit, you should be able to:

- explain the meaning of MIS
- state the goal of MIS
- enumerate the characteristics of MIS
- state the advantages of MIS
- pinpoint the problems of MIS
- explain the meaning of some parameters associated with MIS.

3.0   MAIN CONTENT

3.1   Definition of MIS

MIS is the acronym for Management Information Systems. It refers broadly to a computer-based system that provides managers with the tools for organising, evaluating and efficiently running their departments.

MIS is an analytical tool that enables the integration of data from different business applications, Internet, different modules and business functions. It converts data from internal and external sources into information. This information is communicated in an appropriate form to managers at different levels in a business to enable them to make effective decisions.

A Management Information System (MIS) is a process that provides information needed to manage organisations effectively. It is regarded to be a subset of the overall internal procedures in a business, which cover the application of people, documents, technologies, and procedures used by management personnel 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 analyse other information systems applied in operational activities in the organisation.

3.2   Goal of MIS

The overall goal of Management Information Systems is to help in decision making process, which can be applied in areas like planning, directing, forecasting, coordinating, controlling.

3.3   Characteristics of MIS

MIS should have the following features:

• multidimensional view of data
• advanced calculation options
• current position statement of a company
• business reviews of specific sectors
• working with time series and trend modelling
• option of integrating data from different data sources
• ability to process and analyse huge amount of data
• plan input and review of data also through the excel interface.

3.4   Advantages of MIS

An MIS provides the following advantages:

i.   It 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 organisations, managers have lost personal contact with the scene of operations

ii.   It minimises information overload: MIS change the larger amount of data into summarised form and thereby avoids the confusion which may arise when managers are flooded with detailed facts

iii. MIS encourages decentralisation: Decentralisation 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 organisational plans and procedures

iv.   It brings coordination: MIS facilities integration of specialised activities by keeping each department aware of the problem and requirements of other departments. It connects all decision centres in the organisation

v.   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 use of computers has increased the data processing and storage capabilities and reduced the cost

vi.   MIS assembles, processes, stores, retrieves, evaluates and disseminates information.

3.5   Problems of MIS

The bottlenecks associated with MIS are as follows:

- it is highly sensitive, thus requires constant monitoring
- budgeting of MIS is extremely difficult
- quality of outputs is governed by the quality of inputs
- it lacks flexibility to update itself
- effectiveness usually decreases due to frequent changes in top management
- it takes into account only qualitative factors and ignores non-qualitative factors like morale of worker, attitude of worker etc.

3.6   Basic Concepts of MIS

Here we want to look at those components or terms associated with Management Information Systems. These include data, information, instruction, database, Decision Support Systems (DSS), and application.

3.6.1 Data

Raw facts often in the form of figures, numbers, texts, images, and sounds obtained from observations, surveys or experiments that are suitable for storage in computer used as a basis for making calculations or drawing conclusions. Data represent quantified actions, events or objects.

3.6.2 Information

The meaningful material derived from the computer data by organising and interpreting it in a specific way. Information is actually a data that has been put into a meaningful context and communicated to the receiver who will use it to make appropriate decisions.

3.6.3 Instruction

This is a code that tells the computer to perform a particular operation. A set of instructions ordered to produce a particular action when acted on data is known as a programme.

3.6.4 Relationship between Data, Information and Instruction

From the above definitions, it is a clear fact that data constitutes the raw materials for producing information. Conversely, information is a meaningful term gotten after processing data. But one thing we should not forget is that, processing has to be in specified manner. That is to say, there must be a third party for data to be converted into information, hence, the importance of instruction. It is the instruction that indicates how the data will be converted into the meaningful information. Therefore, it is the instruction that specify the operation to be carried out.

3.6.5 Database

Database is a systematically arranged collection of computer data structured so that it can be automatically retrieved or manipulated. In all management information systems, it is the database that stored the accessible information in order to facilitate organisation's decision making or planning.

Database is a collection of information organised in such a way that a computer program can quickly select desired pieces of data. You can think of a database as an electronic filing system.

Traditional databases are organised by fields, records, and files. A field is a single piece of information; a record is one complete set of fields; and a file is a collection of records. For example, a telephone book is analogous to a file. It contains a list of records, each of which consists of three fields: name, address, and telephone number.

An alternative concept in database design is known as **Hypertext**. In a Hypertext database, any object, whether it is a piece of text, a picture, or a film, can be linked to any other object. Hypertext databases are particularly useful for organising large amounts of disparate information, but they are not designed for numerical analysis. To access information from a database, you need a Database Management System (DBMS). This is a collection of programs that enables you to enter, organise, and select data in a database.

3.6.6 Decision Support Systems (DSS)

The term Decision Support Systems refers to an interactive computerised system that gathers and presents data from a wide range of sources, typically for business purposes. DSS applications are systems

and subsystems that help people make decisions based on data that is culled from a wide range of sources.

For example: a national on-line book seller wants to begin selling its products internationally but first needs to determine if that will be a wise business decision. The vendor can use a DSS to gather information from its own resources to determine if the company has the ability or potential ability to expand its business and also from external resources, such as industry data, to determine if there is indeed a demand to meet. The DSS will collect and analyse the data and then present it in a way that can be interpreted by humans. Some decision support systems come very close to acting as artificial intelligence agents.

DSS applications are not single information resources, such as a database or a program that graphically represents sales figures, but the combination of integrated resources working together.

3.6.7 Hardware/Software

Hardware refers to objects that you can actually touch, like disks, disk drives, monitors, keyboards, printers, circuit boards, and chips. Software exists as ideas, concepts, and symbols, but it has no substance. Textbooks provide a useful analogy. The pages and the ink are the hardware, while the words, sentences, paragraphs, and the overall meaning are the software. A computer without software is like a book full of blank pages -- you need software to make the computer useful just as you need words to make a book meaningful.

The distinction between software and hardware is sometimes confusing because they are so integrally linked. Clearly, when you purchase a program, you are buying software. But to buy the software, you need to buy the disk (hardware) on which the software is recorded.

3.6.8 Applications

Software is often divided into two categories: Systems software: The operating system and all the utilities that enable the computer to function.

Applications software: Programs that do real work for users. Applications software (also called end-user programs) includes database programs, word processors, and spreadsheets. Figuratively speaking, applications software sits on top of systems software because Computer is unable to run without the operating system and system utilities.

3.7   Value of MIS

The value of MIS depends greatly on the user of the information not even on the producer of such 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 organisation. 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.

4.0   CONCLUSION

We notice that Management Information System is any process that can enhance or contribute to how information flows that can be used by the management in overall decision making and planning for its business.

We identified factors to be considered when talking of a good MIS such as: reliability, consistency, and appropriateness to the level of management, accuracy, timeliness, and precision, provided at a suitable level of detail, clarity, comprehensibility, and regularity.

We also looked at the constituents of every MIS which are data, information, instruction, DSS, database, and so on. Instruction was defined as an agent that describes the kind of operation to be performed on data to bring out the meaningful information needed by the computer.

5.0   SUMMARY

In this unit, we learned about the definition of MIS, features and values of MIS and the meaning of terms associated with MIS.

6.0　TUTOR- MARKED ASSIGNMENT

1.　Analyse the relationship among these three terms: data, information and instruction.
2.　Enumerates the bottlenecks associated with MIS.
3.　What is the difference between database and decision support systems as components of MIS?
4.　State the overall aim of MIS.

7.0　REFERENCES/FURTHER READING

Alo, U.R.; Ugah, J.O. & Igwe J.S. (2009). *Computer Application and Information Technology*. Abakaliki, Nigeria: WilyRose and Appleseed Publishing Co.

Ashwin, D. (2008). *Characteristics of Management Information Services* Online @ http://www.blog.maia_intelligence.com, visited on 24th September, 2010.

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Ramesh, A.; Singh, Y. & Sachdeva R. (2008). Establishing a Management Information System. Online @ http://www.fao.org, visited on 22nd September, 2010.

UNIT 2   TYPES OF MIS

CONTENTS

1.0   INTRODUCTION

In this unit, we shall be considering the different categories in which MIS can exist. The classification is based on the level of support that the information system provides in the process of decision making.

2.0   OBJECTIVE

At the end of this unit, you should be able to:

- identify and describe the different types of MIS.

3.0   MAIN CONTENT

Management Information System can be classified according to goal or methodology in vogue in a particular organisation.

3.1   Databank Management Information System

This kind of information system is used to store any item of data which might be useful to the decision maker. A databank is a collection of files used by an organisation stored such that one file may have record/fields duplicated in other files. Examples of the kind of data that might be recorded in such a database for a given state with respect to secondary school are as follows:

- Number of schools in the state.
- Total number of secondary school tutors in the state.
- Average number of tutors per school.
- Total number of students in the state.
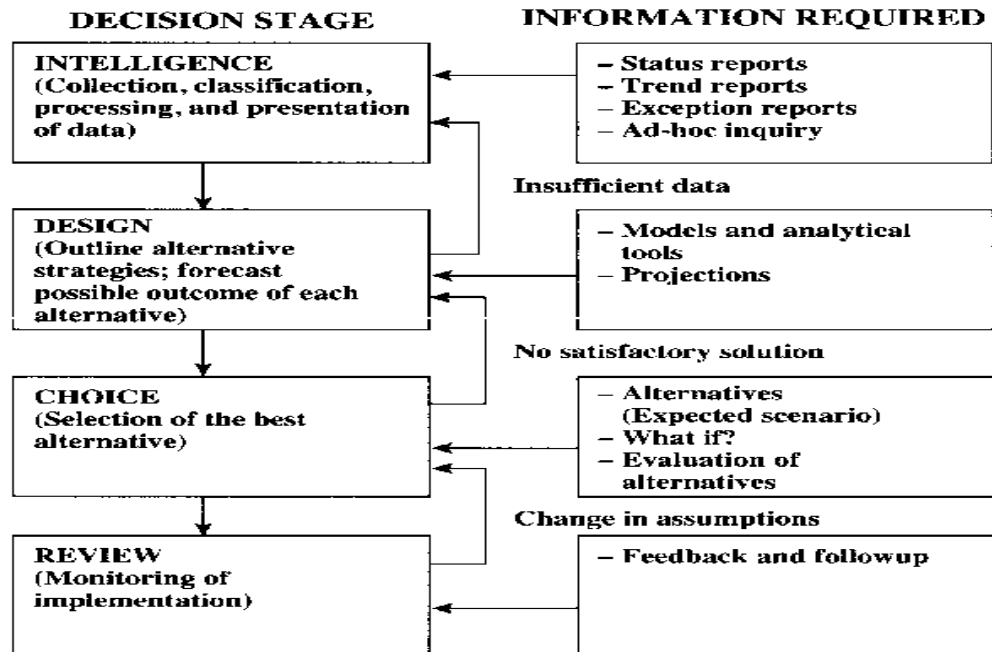- Average number of students per school.

Fig. 1:   Role of Information in the Decision Process

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

3.2   Predictive Management Information System

Predictive information systems help in drawing of inferences and predictions that are relevant to decision making. It is possible to obtain information useful for making predictions or for drawing inferences based on the facts gathered like in the case of section 3.1. Information obtained from these kinds of analyses is normally summarised in a two-way tabular format. And likewise, the information often is compared over time. Managers can then use such information to make predictions, for example to forecast costs of particular undertakings for budgeting purposes or as a basis for predicting results if a given change is made, such as change in the number of demonstrations with a given change in staffing.

3.3   Decision-Taking Management Information System

This is a decision system in which the information system and the decision maker are one and the same. Management is so confident in the assumptions incorporated in the system that it basically relegates its power to initiate action to the system itself. Airplanes carry automatic pilot systems, which is an example of a decision-taking system. Once activated, the system itself keeps the plane on course and at the proper speed and altitude (according to parameters determined by the pilot). Another example of decision-taking information systems is found in modem factory production. In automobile production, continuous inventories of parts are maintained by computer as cars move down an assembly line. Orders are placed automatically by the computer when additional parts are needed. This is done without the intervention of a manager.

3.4   Decision Making Management Information System

This system incorporates the value system of the organisation or its criteria for choosing among alternatives. An organisation's values are many and varied. Considering the case of agricultural sector, there is numerous point of discourse where meaningful decisions have to be taken for the uplift of the sector. They include concerns for resolving farmer problems, increasing and providing for stability of farmer incomes, and improving the quality of farm life. But they also include an intent to provide well for staff members (training, adequate salaries, etc.) and to aid in the process of bringing about rural economic development.

4.0   CONCLUSION

The choice of an appropriate management information system (MIS) category primarily depends on the nature of the decisions it supports.

5.0   SUMMARY

In this unit, we looked at the four classes of Management Information System.

6.0   TUTOR-MARKED ASSIGNMENT

Highlight the types of MIS you know.

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UNIT 3   LEVELS OF MANAGEMENT

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
        3.1   Levels of Management
                3.1.1   Top Management Level
                3.1.2   Middle Management Level
                3.1.3   Operational Management Level
        3.2   Communication among Levels of Management
        3.3   Management Structure and MIS
        3.4   Development of Management Information System
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Reading

1.0   INTRODUCTION

We are going to discuss the various levels of management system that exist. Also necessary, is the communication channels existing among the established levels of management.

2.0   OBJECTIVES

At the end of this unit, you should be able to:

- discuss different levels of management
- analyse how the various levels of management interact
- state how management information system developed.

3.0   MAIN CONTENT

3.1   Levels of Management

There are three levels of management that could be identified in most organisations. They are: top management cadre (strategic level), middle management cadre (tactical level), and operational group cadre (operational level).

3.1.1 Top (Strategic) Management Level

This level of management coordinates the activities of the whole organisation and has a strategic view of the organisation. This level is concerned with establishing (estimating) the overall objectives of the organisation and in devising appropriate policies so that the objectives may be achieved.

Typical of the functions of top management are:

- long term planning
- capital investment decisions
- organisational restructuring
- middle management appointment
- acquisitions and mergers.

The top management level is the overall policy making section of the management and as such will be actively involved in corporate planning process of an organisation.

3.1.2 Middle Management Level

This may be termed the tactical level of management whose overall function is to implement top management policy. This level of management does set objectives but these objectives are more limited in scope and are subordinate to the objectives set by the top management level.

Examples of the functions of the middle management are:

(i)   purchasing
(ii)   product planning
(iii)   sales promotion
(iv)   discount and credit policy
(v)   staff appointment
(vi)   implementation of marketing and advertising policies of the organisation.

3.1.3 Operational Level of Management

This level of management is concerned with the day-to-day process of supervision i.e. direction associated with the normal activities of the organisation.

Functions of the operational level are:

* production
* dispatching
* sale
* accounting.

Often, this level of management may not be called managers but they have titles, such as charges, heads, supervisors, chief clerical foremen, etc. Even though the work this group does involves management, it is of different categories.

3.2   Communication among Levels of Management

It is important that these groups of management levels will be able to communicate effectively for the purpose of achieving effective goals of an organisation. It has been observed that this group of management levels has been able to pass all necessary information in the form of communication within the different groups. It is important also that information from the top management level be passed down through the usual procedure. Normally, information from top management level will not go to the operational level first before the middle management level for adequate flow of information within an organisation. It is a bad system of information flow and it encourages misinformation and confusion in an organisation. Therefore, information has to be communicated from the top management level to the operational level through the middle management level; and vice versa.

3.3   Management Structure and MIS

A broad structure of information supplied by MIS is divided into planning and controlling. This division is of great importance not only because of the intrinsic nature of these two types of information management but also because of the destruction within the management structure. Figure below illustrates the broad relationship between the proportion of planning and controlling information received and management place in hierarchy.
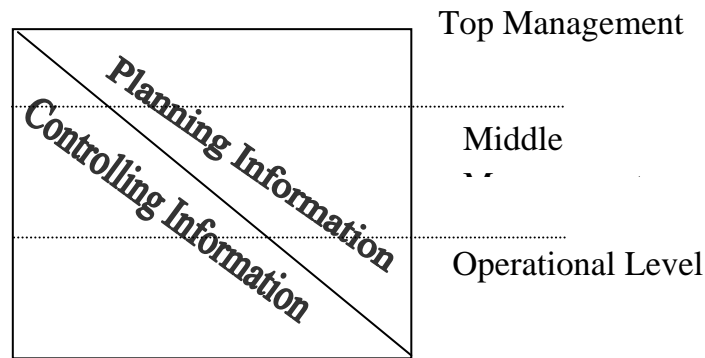
Fig. 2:   Relation between Planning and Control at different Management Levels

Top management level deals with more planning of information than controlling of information. This level has little of control of information as figure 2 shows but at the middle management level, the planning and controlling of information are proportionate (about equal).   The operational level has very little to do of planning but controls what is going on and implement the plans of top and middle management levels.

3.4   Development of Management Information System

All levels of management need information on which to base decisions, to plan, to organise and to control. People organise information directly by way of observing and experiencing events. But as an organisation becomes larger and more complex, it becomes impossible for management, particularly the middle and top management levels to observe and experience all operations. In some form of decentralised organisations, management virtually never saw the actual events and has to rely almost entirely on information provided through the formal and informal channels. Although much viable information is passed through decisions, meetings and casual conversations, such methods do not generally give a complete picture nor do they provide information in the correct form of intended use.

So, as an organisation grows, there is a shift from informal to more formal methods of disseminating information. More formal information systems are observed through reports, operating system, special analysis, various returns, balance sheet returns, etc. These have the advantages of comprehensiveness, consistency, and reasonable accuracy but may suffer from the disadvantages of not meeting the exact requirements of the problem at hand, the lack of flexibility, time lag of events or operations to reports and costs. In spite of these possible disadvantages, the development of MIS is virtually necessary in most organisations today.

4.0   CONCLUSION

Different levels of management exist in organisation ranging from top level management to middle to operational level. And these levels of management need information on which to base decisions for proper planning, organisation and control.

5.0   SUMMARY

This particular unit has x-rayed the three levels of management, how these levels developed and even tried to analyse the communication channels existing among these levels.

6.0   TUTOR-MARKED ASSIGNMENT

1.   Mention and explain any three levels of management in an organisation.
2.   How is communication channelled among the levels of management?
3.   Discuss management structure in relation to MIS.

7.0   REFERENCES/FURTHER READING

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MODULE 2   INFORMATION TECHNOLOGY

Unit 1   Overview of Information Technology
Unit 2   Technologies for Information System
Unit 3   Internets
Unit 4   Modes of Information Communication

UNIT 1   OVERVIEW OF INFORMATION TECHNOLOGY (IT)

CONTENTS

1.0   INTRODUCTION

This unit discusses the concept of information technology bringing out its relevance in the management of information in our organisations.

2.0   OBJECTIVES

At the end of this unit, you should be able to:

• give the meaning of information technology
• state the reasons for information technology
• list the different areas of application of IT.

3.0   MAIN CONTENT

3.1   Meaning of Information Technology

Information technology is the technique employed in acquiring, processing, storage and dissemination of audio, video, pictorial, textual and other discrete information with the aids of electronics computing devices and telecommunication gadgets. It actually combines computing with high-speed communication links carrying information of differing sorts as sound, video, text or ordinary image. Technologies such as cell phones, pagers fax machines, and portable computer has reduced the meaning attached to physical locations in terms of time, work, and leisure to mere formalities.

3.2   Reasons for Studying Information Technology

Some of the purposes for learning about information technology are to:

- maximise the available information
- save time of service delivery
- reduce cost of running an organisation
- reduce complexities in our organisation
- understand how best to use systematic approach in processing and management of information
- improve on the quality of production.

3.3   The Ethics of Information Technology

By the ethics of information technology we mean the principles and values governing the use of telecommunication gadgets in relation to information dissemination. Some of the ethical issues are highlighted below:

i.   Complexity: The internal working of information technologies is so complex that not even the manufacturers or the system designers can effectively describe the workings. Its inherent digital properties of ON/OFF makes it look simple, but putting together all that is needed for effective information dissemination bring out the complexity factor.

ii.   Speed: Storage, retrieval, and transmission of great amount of information require greater speed and scale not obtainable before. This is essentially necessary in the area of data security and personal privacy. It is worth knowing that information can never be considered totally secure against access.

iii.   Predictability: Information technology is less predictable and reliable when compared to other pervasive technologies as electricity, television, and automobiles. This is because computers and communications require more spontaneous responses especially in real time transaction.

3.4   Application of IT in Information System

There are three areas of application of IT in information systems, viz:

i)   office support systems
ii)   data processing
iii)   end user computing.

3.4.1 Office Support Systems

The specific area of IT applications in our offices includes text handling, data storage and referencing, microform, and telecommunication.

A word processor can either be a dedicated word processor or a general purpose micro-computer utilising a word processing programme. Word processors are keen in producing standard letters or reports which requires extensive editing and revision. Word processors improve both productivity and quality. The advent of photocopier has immensely contributed to present day text handling in offices especially with the case of colour and graphics. Enhancement in Desk Top Publishing (DTP) was facilitated by the developments in software and laser printers. This enables professional quality books, reports, literal arts and other documentations to be produced in-house.

Information Technology has made it possible to store and access vast volumes of data in our organisations or offices. VDUs and other terminal accessories are used in accessing files maintained in disk backing storage. This facility is invaluable for current operations and for internal information, but where there is the need for repeated reference of information in a visual form, then, either computer output or microform. Another IT invokes is teletext where existing television networks are used as a channel for supplying information. An offshoot of teletext is view-data that provides electronic reference to material interactively. That is, the user can interrogate the data held in the system and also supply information to it. The system uses a combination of telephones, computers, televisions and communication networks. A known view-data is the British Telecom called PRESTEL.

Another special aspect to consider as far as IT application to office is concern is telecommunication. The facilities that were classified under telecommunication include electronic mail, voice mail, networks, tele-conferencing, facsimile and electronic data interchange. All these technologies will be emphasised in more detail in the next unit.

Microforms are photographically reduced information on files. Computer information on disk is fed into a machine called a microform recorder which read the data on the disk and copy it onto the microform. Full size copies can be printed on desire. Reference and archive material is ideally suited for computer output microform. Example is the libraries and stores. Document image processing is another form of electronic filing. A document is passed through a scanner, translated into a digital form, and a digitised image is then stored electronically.

3.4.2 Data Processing

This is otherwise refers to as transaction processing. This is necessary in order to ensure that day-to-day activities of the organisation are processed, recorded and operated upon. These systems perform the essential role of collecting and processing the daily transactions of the organisation. They include all forms of ledger keeping, accounts receivable and payable, invoicing, credit control, rate demands and stock movements. The availability of mini and micro computers has made distributed data processing more feasible and popular. Transaction processing is essential to keep the operations of the organisation running smoothly and provides the base for all other internal information support.

3.4.3 End User Computing

Ordinarily, the individuals who had direct contact with computers were the system programmers, analysts, designers etc. But the advent of personal computers, computer terminals, networks of all sorts, user-friendly software, databases and different utility programmes has turned the direction drastically, which in turn has multiply the growth of end-user computing.

Some of the applications that support the end user computing are:

i.   Decision Support Systems (DSS)
ii.   Expert Systems
iii.   Executive Information Systems
iv.   Text handling and publishing
v.   Computer based training

vi.   End user programming
vii.   Search and retrieval of information.

The objective of decision support system is to support managers in their work, especially decision making. This unit tend to bring together data processing systems and office support systems. DSS tend to be used in planning, modelling, analysing alternatives and decision making. For an interactive computer –based system to exist, the following criteria has to be met:

- there must be a large database
- large data manipulation
- complex inter-relationships among fields or records in the database
- analysis by stages in case of iterative problem
- communication involving many personnel
- judgement is required.

An expert system is a computer system which has an encoded experience and specialised knowledge of an expert. It uses a reasoning which bears some resemblance to human thought. The two major components of an expert system are knowledge base and inference engine. The knowledge base encompasses the human expertise or facts about the area in question. The inference engine is the totality of the set of rules to be applied in other to elicit fact from the knowledge base which will help in making the final conclusion.

4.0   CONCLUSION

Information technology has taken over the chores normally associated with office work, data processing and end user computing. It is very hard for an organisation to execute any project without in one way or other involving these technologies.

5.0   SUMMARY

This unit emphasised the meaning surrounding the concept 'information technology', the reasons we need information technology, the ethics employs in the usage of these technologies and the application of these technologies in the management of information.

6.0   TUTOR- MARKED ASSIGNMENT

1.   What is information technology?
2.   Enumerates the ethics of information technology.
3.   Describe the three areas of IT application in information technology.
4.   Mention four applications that support end user computing.
5.   List the criteria needed for interactive computing in decision support system.

7.0   REFERENCES/FURTHER READING

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UNIT 2   TECHNOLOGIES FOR INFORMATION SYSTEM

CONTENTS

1.0   INTRODUCTION

In this unit, we are going to discuss the notable technologies present today in offices and organisations. We are to explain in detail terms each technology with respect to its relevance in the management of information in our organisations.

2.0   OBJECTIVES

At the end of this unit, you should be able to:

- explain the following terms
- E-mail
- Teletext
- Fax
- Bulletin Board Service
- Voice mail
- Networks
- Tele-conferencing and video-conferencing
- Telnet.

3.0   MAIN CONTENT

3.1   Electronic Mail

Electronic mail is a method of transmitting data, text files, digital photos, or audio and video files from one computer to another over an intranet or the Internet. E-mail is a method of exchanging digital messages across the internet or other computer network. Originally, e-mail was transmitted directly from one user to another computer. This required both computers to be online at the same time. It enables computer users to send messages and data quickly through a local area network or beyond through the Internet. E-mail widespread has become a major development in business and personal communications in recent years. The e-mail is a store and forward technology.

E-mail users create and send messages from individual computers using commercial e-mail programmes or mail-user agents (MUAs). Most of these programmes have a text editor for composing messages. The user sends a message to one or more recipients by specifying destination addresses. An email message consists of two components, the message header, and the message body, which is the e-mail's content. The message header contains control information, including, minimally, an originator's email address and one or more recipient addresses. Usually additional information is added, such as a subject header field. Originally a text-only communications medium, email was extended to carry multi-media content attachments.

The address of an e-mail message includes the source and destination of the message. Different addressing conventions are used depending upon the e-mail destination. An interoffice message distributed over an intranet, or internal computer network, may have a simple scheme, such as the employee's name, for the e-mail address. E-mail messages sent outside of an intranet are addressed according to the following convention: The first part of the address contains the user's name, followed by the symbol @, the domain name, the institution's or organisation's name, and finally the country name.

A typical e-mail address might be *igwejoe@ebsu.edu*. In this example *igwejoe* is the user's name; ebsu is the domain name—the specific company, organisation, or institution that the e-mail message is sent to or from; and the suffix *edu* indicates the type of organisation that *ebsu* belongs to—*com* for commercial, *org* for organisation, *edu* for educational, *mil* for military, and *gov* for governmental. An e-mail message that originates outside the United States or is sent from the United States to other countries has a supplementary suffix that indicates

the country of origin or destination. Examples include *uk* for the United Kingdom, ng for Nigeria, *fr* for France, and *au* for Australia.

E-mail data travels from the sender's computer to a network tool called a message transfer agent (MTA) that, depending on the address, either delivers the message within that network of computers or sends it to another MTA for distribution over the Internet. The data file is eventually delivered to the private mailbox of the recipient, who retrieves and reads it using an e-mail programme or MUA. The recipient may delete the message, store it, reply to it, or forward it to others.

E-mail messages are not secure if e-mail encryption is not used correctly.

Many MTAs used to accept messages for any recipient on the Internet and do their best to deliver them. Such MTAs are called open mail relay. This was very important in the early days of the Internet when network connections were unreliable. If an MTA couldn't reach the destination, it could at least deliver it to a relay closer to the destination. The relay stood a better chance of delivering the message at a later time. However, this mechanism proved to be exploitable by people sending unsolicited large e-mail and as a consequence very few modern MTAs are open mail relays, and many MTAs don't accept messages from open mail relays because such messages are very likely to be spam.

3.2   Teletext/View-data

Teletext is written information on television. It is also a term used to refer a system of broadcasting news and other information in written form that can be viewed on specially equipped television sets, superimposed on, or in place of, the picture. It is a system for transmitting commercial and other information through existing television networks. Teletext is a one-way, or non-interactive, system for transmission of text and graphics via broadcasting or cable for display on a television set. A decoder or microchip resident in the TV set is needed to extract the teletext information. Teletext can be transmitted over one-way cable or over-the-air broadcasting via radio or television. In the case of TV, it can occupy a full channel or be encoded in the vertical blanking interval, or VBI.

View-data is a videotext implementation. It is a type of information retrieval service in which a subscriber can access a remote database via a common carrier channel, request data and receive requested data on a video display over a separate channel. View-data is an interactive information system in which text and graphic data stored in a central

computer are transmitted over telephone lines to be displayed on a modified television receiver. View-data is different from teletext in some ways. For instance, users can interrogate the data held in the system and also supply information to it. And also the view-data system uses a combination of telephones, computers, television, and communication networks. View-data is still in use today in the United Kingdom, mainly by the travel industry. Travel agents use it to look up the price and availability of package holidays and flights.

3.3   Fax

Facsimile transmission is a technology that allows an exact copy of an original document including diagrams, pictures and text to be electronically in digitised form over telephone lines and reproduces in its original form at the receiving end. It performs similar function as photocopying machine with the difference of using a telephone to cover a long distance. The most recent and improved fax machine can interactively be used to transmit both voice and data simultaneously.

Although businesses usually maintain some kind of fax capability, the technology has faced increasing competition from internet-based alternatives. However, fax machines still retain some advantages, particularly in the transmission of sensitive material which, if sent over the Internet unencrypted, may be vulnerable to interception. In some countries, because electronic signatures on contracts are not recognised by law while faxed contracts with copies of signatures are recognised, fax machines enjoy continuing support in business.

In many corporate environments, standalone fax machines have been replaced by "fax server" and other computerised systems capable of receiving and storing incoming faxes electronically, and then routing them to users on paper or via an e-mail (which may be secured). Such systems have the advantage of reducing costs by eliminating unnecessary printouts and reducing the number of inbound analog phone lines needed by an office.

3.4   Bulletin Board System

This is an online forum used to exchange e-mails, chat, and access software. Bulletin board system is a computer or an application dedicated to the sharing or exchange of messages or other files on a network. Originally an electronic version of the type of bulletin board found on the wall in many work places, the BBS was used to post simple messages between users. The BBS became the primary kind of

online community through the 1980s and early 1990s, before the World Wide Web arrived.

Most BBSes are devoted to a particular subject, although some are more general in nature. Among special interests represented on BBSes are dentistry, law, guns, multi-player games, Druidic practices, and information for the disabled. A significant number of BBS sites offer "adult-oriented" chat and images that can be downloaded. The BBS is often free, although some charge a membership or use fee. Many BBSes have Websites, and many Internet access providers have bulletin board systems from which new Internet users can download the necessary software to get connected. The BBS has its own culture and jargon. For example, a sysop is the person who runs the site. Online chat became widely popular through the BBS and many chat acronyms originated there.

3.5   Voice- Mail

Voicemail (also known as voice-mail Systems (VMS) or message bank) is a centralised system of stored telephone messages that can be retrieved later. The term is also used more broadly to denote any system of conveying a stored telecommunications voice message, including using an answering machine. It is electronic communication system that stored digitised recording of telephone messages for later playback.

Voicemail systems are designed to convey a recorded audio message to a recipient. To do so they contain a user interface to select, play, and manage messages; a delivery method to either play or otherwise deliver the message; and a notification ability to inform the user of a waiting message. Most systems use phone-networks, either cellular or land-line based, as the conduit for all of these functions. Some systems may use multiple telecommunications methods, permitting recipients and callers to retrieve or leave messages through multiple methods.

Simple voicemail functions as a remote answering machine using a touch-tone as the user interface. More complicated systems may use other input devices such as voice or a computer interface. Simpler voicemail systems may play the audio message through the phone, while more advanced systems may have alternative delivery methods, including email or text message delivery, message transfer and forwarding options, and multiple mailboxes.

Notification methods also vary based on the voicemail system. Simple systems may not provide active notification at all, instead requiring the

recipient to check with the system, while others may provide an indication that messages are waiting.

Almost all modern voicemail systems use digital storage and are typically stored on computer storage devices.

3.6   Telnet

This is an internet service that makes a user's computer a terminal to other computers on the internet. It presents a user to appear to be physically using another computer which is away from his own computer. Individual on his own can run programs, delete files, view content files, modify, save, lock files in another or remote computer.

To cut short, telnet is a terminal emulation program that allows computer users to connect interactively to a server and access remote sites. It was the first packet-switched network service that was available to the general public. Various commercial and government interests paid monthly fees for dedicated lines connecting their computers and local networks to this backbone network. Free public dialup access to telnet, for those who wished to access these systems, was provided in hundreds of cities throughout the United States.

3.7   Network

A computer network, often simply referred to as a network, is a group of computers and devices interconnected by communications channels that facilitate communications among users and allows users to share resources. It is a system of two or more computers, terminals, and communications devices linked by wires, cables, or a telecommunications system in order to exchange data.

The network may be limited to a group of users in a local area network, or be global in scope, as the Internet is. Network users are able to share files, printers, and other resources; send electronic messages; and run programs on other computers. A computer network allows sharing of resources and information among interconnected devices.

In the 1960s, the Advanced Research Projects Agency (ARPA) started funding the design of the Advanced Research Projects Agency Network (ARPANET) for the United States Department of Defence. It was the first computer network in the world. Development of the network began in 1969, based on designs developed during the 1960s.

A network has three layers of components: application software, network software, and network hardware. Application software consists of computer programmes that interface with network users and permit the sharing of information, such as files, graphics, and video, and resources, such as printers and disks. One type of application software is called client-server. Client computers send requests for information or requests to use resources to other computers, called servers that control data and applications. Another type of application software is called peer-to-peer. In a peer-to-peer network, computers send messages and requests directly to one another without a server intermediary.

Network software consists of computer programmes that establish protocols, or rules, for computers to talk to one another. These protocols are carried out by sending and receiving formatted instructions of data called packets. Protocols make logical connections between network applications, direct the movement of packets through the physical network, and minimise the possibility of collisions between packets sent at the same time.

Network hardware is made up of the physical components that connect computers. Two important components are the transmission media that carry the computer's signals, typically on wires or fibre-optic cables, and the network adapter, which accesses the physical media that link computers, receives packets from network software, and transmits instructions and requests to other computers. Transmitted information is in the form of binary digits, or bits (1s and 0s), which the computer's electronic circuitry can process.

A network has two types of connections: physical connections that let computers directly transmit and receive signals; and logical or virtual, connections that allow computer applications, such as e-mail programs and the browsers used to explore the World Wide Web to exchange information. Physical connections are defined by the medium used to carry the signal, the geometric arrangement of the computers (topology), and the method used to share information. Logical connections are created by network protocols and allow data sharing between applications on different types of computers, such as an Apple Macintosh or a personal computer (PC) running the Microsoft Corporation Windows operating system, in a network. Some logical connections use client-server application software and are primarily for file and printer sharing. The Transmission Control Protocol/Internet Protocol (TCP/IP) suite, originally developed by the United States Department of Defence, is the set of logical connections used by the Internet, the worldwide consortium of computer networks. TCP/IP,

based on peer-to-peer application software, creates a connection between any two computers.
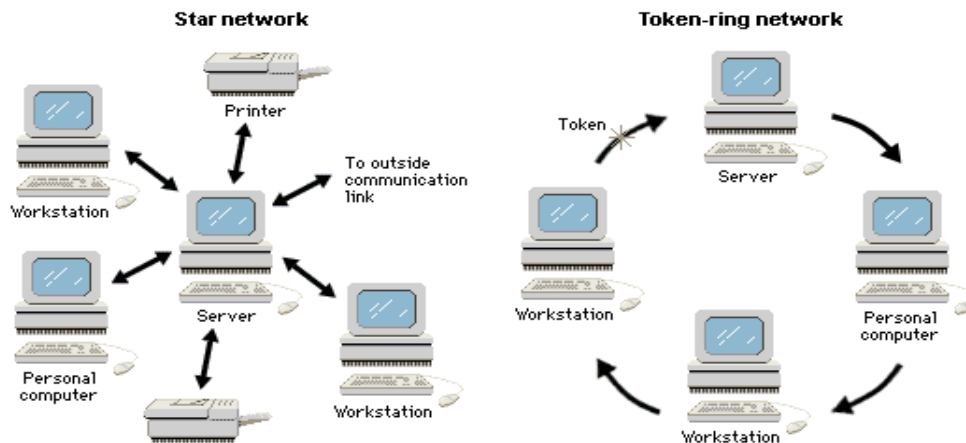

Fig. 3:   Diagram of Star and Ring Topology

3.8   Teleconferencing and Videoconferencing

Tele-conference is an offshoot of one-to-one telephone conversation. It allows many people to be simultaneously connected so that discussion can take place even when they reside in different places at the time. The impact it creates facilitate speedy gathering and assessing of information in an organisation. Teleconferencing has only one shortcoming, which is its inability to identify or authenticate the speakers during meeting.

Video-conferencing is the technology where participants in different places connected by both audio and video links hold meetings. Though videoconferencing is far more expensive than teleconferencing, it solves the problem of user identification. An example is MTN e-Presence.

4.0   CONCLUSION

There is no gainsaying the fact that numerous technologies such as e-mail, telnet, teleconference, networking, view-data and so on has taken over the day-to-day office work. This has landed us into information age as everybody knows today that the world as a global village is a product of information technologies described above.

5.0   SUMMARY

This unit itemised one after the other eight information technologies employed today in office, which include: electronic mail, telex, voicemail, computer network, teleconference and video conference, fax, Bulletin Board Service and telnet.

6.0   TUTOR-MARKED ASSIGNMENT

1.   Demarcate between teleconference and videoconference.
2.   View-data is an example of information technology. True or false?
3.   MUA stands for what?
4.   Use diagram to demonstrate star topology arrangement.
5.   Write short note on the following: voice mail, email, teletext and networking.

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UNIT 3   INTERNET

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
        3.1   Origin of the Internet
        3.2   Requirement for Internet Connectivity
        3.3   Information Format on the Internet
        3.4   Internet Usage
        3.5   Limitation of the Internet
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Reading

1.0   INTRODUCTION

Calling the world a global village is another way of appreciating the role the internet has played in the development of both the world economy and the societal lives of its inhabitants. Internet is the master disseminator of information around the globe.

2.0   OBJECTIVES

At the end of this unit, you should be able to:

- give the meaning of internet and its origin
- state the requirement for connecting to the internet
- explain the different formats information can be displayed
- get more information on the usage of the internet
- list the limitations of the internet.

3.0   MAIN CONTENT

The Internet is a vast connectivity of global network linking several other networks and electronically associating millions of people and computer users around the world. The networks makes it possible for information stored in the major computers connected to it known as hosts, to be accessible by other users irrespective of the distances separating them. The Internet is the base of global communication and information sharing.

The internet is hosted by several computers networked together as shown in the figure 4 below.
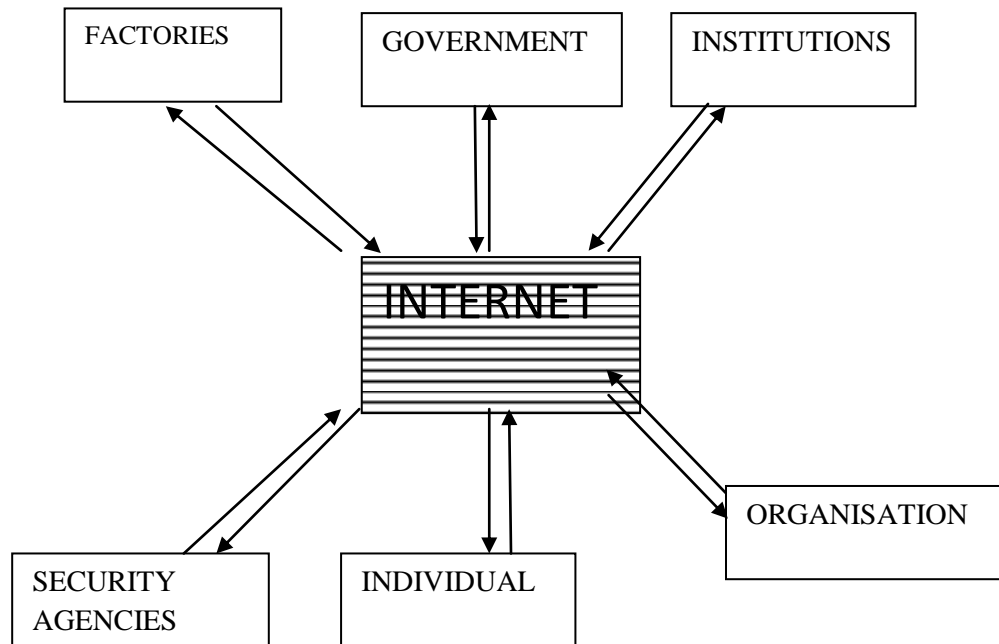

Fig. 4:   Dissemination of Information to and fro the Internet

3.1   Origin of the Internet

History had it that in the 1950s and early 1960s, prior to the widespread inter-networking that led to the Internet, most communication networks were limited in that they only allowed communications between the stations on the network. Some networks had gateways or bridges between them, but these bridges were often limited or built specifically for a single use. One prevalent computer networking method was based on the central mainframe method, simply allowing its terminals to be connected via long leased lines. This method was used in the 1950s by Project RAND to support researchers such as Herbert Simon, in Pittsburgh, Pennsylvania, when collaborating across the continent with researchers in Sullivan, Illinois, on automated theorem proving and artificial intelligence. The research led to the development of several packet-switched networking solutions in the late 1960s and 1970s, including ARPANET and the X.25 protocols. The ARPANET involved several experts from the government, military, universities and the public to decentralise the network for other users apart from the United States Defense.

Additionally, public access and hobbyist networking systems grew in popularity, including unix-to-unix copy (UUCP) and FidoNet. They were however still disjointed separate networks, served only by limited

gateways between networks. This led to the application of packet switching to develop a protocol for inter-networking, where multiple different networks could be joined together into a super-framework of networks.

It was in 1989 when the National Science Foundation (NSF) took over from ARPANET to form the NSFNET that the Internet as we have it today evolved. Several supercomputers were provided to serve as a hosts or main servers, and involved private companies and other business networks to serve as links for smaller users.

By defining a simple common network system, the Internet protocol suite, the concept of the network could be separated from its physical implementation. This spread of inter-network began to form into the idea of a global inter-network that would be called 'The Internet', and this began to quickly spread as existing networks were converted to become compatible with this. This spread quickly across the advanced telecommunication networks of the western world, and then began to penetrate into the rest of the world as it became the de-facto international standard and global network. However, the disparity of growth led to a digital divide that is still a concern today.

The use of the World Wide Web, which was developed in the late 80s to allow for graphics and multimedia, and the integration of several aspects of the Internet, was introduced in the early 90s.

3.2   Requirement for Internet Connectivity

For anyone to connect to the Internet, he/she will need certain components. The basic requirements for one to connect to the internet include the following:

- **Computer System:** You can use PC or any type of computer such as IBM-compatible or Macintosh computer to connect to the Internet. It is advisable to use a system with at least 128 MB of RAM, 10 gigabytes of hard disk and above, Windows NT, 95 or higher versions of windows operating system e.t.c
- **Modem (Modulator-Demodulator):** A modem is a device that lets computers communicate through telephone lines. Modems provide easy way to access information on the Internet. There are also other high speed connections such as an integrated services Digital Network (ISDN), Digital subscriber Line (DSL), radon technology etc.

- **Phone Line:** You use the same phone line for telephone and modem calls.
- **ISP:** ISP stands for Internet service provider. An ISP is a company that gives you access to the Internet for a fee.
- **Cables and phone sockets**: You need cables to connect your modem to the phone socket and the computer. The computer needs to connect to the modem which in turn dials up the ISP using the phone socket.
- **Browser:** Browsers are software programmes that allow you surf or browse the Internet. A typical example of a browser is the Internet explorer, Mozilla Fireworks, and the Netscape navigator.

3.3   Information Format on the Internet

Information is stored on the Internet in different formats. The most common and most popular are discussed below:

i.   **Web pages:** A web page is made up of text, pictures, animations and hyperlinks (a hyper link or simply link is the underline word, or phrase on a web page which when clicked on will take you to another section of the page or to another page(s) entirely) .A collection of related web pages is called a web site and collection of web sites on the Internet is called the World Wide Web (www).

ii.   **File transfer protocol (FTP):** FTP allows you to download a file to your personal computer.

iii.   **Email:** This format allows you to send and receive messages to specific people of interest.

iv.   **Newsgroups:** The groups let you exchange information among the entire group of people sharing the same interest. It is been used widely by Newspaper publishers over the internet.

3.4   Internet Usage

The first time you connect to the Internet, you need to enter your username and your password and the number to dial if you are using dial-up connection. All these information can be found from the letter from your ISP. Your computer can then save these items so that you don't have to type in them every time you want to connect to the Internet. If you are on a cyber café, all you need to do every time is to type in your username and password to gain access to the Internet. The essence of this process is to either authenticate the user's permission to use the internet through the local network or through the ISP, or to estimate the period when the Internet is in use.

You start accessing the internet as soon as you start your browser either by double clicking it on the desk top or lunching it through the task bar or start menu. The common operations involved in surfing the Internet include:

Browsing the Web-site: It is an activity in which internet user navigate through web pages for information. To visit a website, you must know the web-site's name you want to visit. To visit a web site, just type the name of the web site in the address field and click go or press "Enter" key on the keyboard. The home page of the web site is displayed, from where you can view or link other pages of the site.

Search the Web: To search the web means to look for information on the Internet. With the help of Internet search engines, one can easily get at particular information on the web. An Internet search engine is an Internet site designed to help user find information on a given subject, usually by locating several sites or web pages that have the required information. There are many search engines existing today. They include: google.com, yahoo.com, altavista.com, 37.com, ask.com, USA.com, infoseek.com, lycos.com, 87.com, metacrawler.com, webcrawler.com, and excite.com. The Google site is essentially a search engine that does not provide many other public websites services. It has one of the largest database coverage, searching more than 3 billion web pages to provide matches for queries.

When you type in the keywords into the search box and click **Google Search,** it then queries for the information across millions of web pages and in seconds presents you with several options.

Downloading a File: To download a file means to copy a file from the Internet to your computer. Actually to download implies to move data from a larger computer folder to a smaller one. Most downloadable programs in the internet provide for a link to be clicked on by those who want to download, and information, such as: <u>click here to download,</u> is given to notify the user.

3.5   Limitations of the Internet

There are quite a few limitations of the Internet or disadvantages, which include that Internet:

- is time consuming
- is sometimes costly
- can have corrupting influence
- degrades morals

- causes anxiety
- causes stereotyping
- can be a tool for dissemination of heresy
- has privacy infiltration risks.

Attraction of people to your web site is a very **slow, tedious process** - search engines can take up to 3 to 6 months to start reporting your site.

4.0   CONCLUSION

Much as you know, Internet today means the world business either in items of buying and selling of goods and services or transacting, negotiating and reaching agreement with other firms on the net. So much varying services it provides that maximise the essence of information technology. Based on personal value, little mention bottlenecks exist as enumerated above.

5.0   SUMMARY

This unit discusses the concept of internet; its emphasis much on its origin, the requirement for its connectivity, the information format, its usage and the limitation for the usage.

6.0   TUTOR-MARKED ASSIGNMENT

1.   What is Internet?
2.   Enumerate the limitations of the Internet.
3.   Write short note on any three Internet usages.
4.   Give brief history of the Internet.

7.0   REFERENCES/FURTHER READING

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UNIT 4   MODES OF INFORMATION COMMUNICATION AND COMPUTER OPERATION

CONTENTS

1.0   INTRODUCTION

Communication they say is the brain behind information. An obvious fact is that without communication there is no information flow.

2.0   OBJECTIVES

At the end of this unit, you should be to:

- identify the different ways information can be communicated
- explain the modes of computer operation.

3.0   MAIN CONTENT

Information can be communicated from one system to another of the following modes: simplex, half and full-duplex, and network modes.

3.1   Simplex Mode

In this mode of information communication, information flow takes place only in one direction. That is, information can be either

transmitted or received but not both. A system can only receive information and will never transmit information or transmit only but cannot receive information. A commercial radio station transmission is an example of simplex mode of communication.

3.2   Duplex Mode

In this mode of information communication, information flow both directions. A mode of where the information flow in both directions, but not at the same time is referred to as half-duplex mode of communication. But a full-duplex mode allows communication in both directions and the same time as well. An example of half – duplex mode system is a two-way radio set popularly known as walkie-talkie that allows one user listens while the other talks as the circuitry of the receiver is automatically turn off during transmission mode. A good example of full duplex mode is the handsets available everywhere today.

3.3   Network System Mode

Computer network system is a communication system whereby many computer systems are linked together for the purpose of sharing information as well time among the computer users. Distribution of computations among computers, coordination among processes running on different computers, remote input/output device accesses, remote data and file accesses, personal communications, internet, world wide web are possible through computer network system.

3.4   Computer Operation Modes

Modes of computer operation refer to various ways computer can be operated upon with regard to other computer or components. We are going to discuss three modes of operation: stand alone, batch processing and time-sharing modes.

3.4.1 Stand-Alone Mode

In this mode of operation, it is only one user that is permitted a time to use the computer. This implies that a current user must quit and give way before another user can operate the system. This mode is rampantly used especially with personal computers as laptops, desktops or notebooks.

3.4.2 Batch Processing Mode

This is a mode of operation whereby tasks belonging to different computer users are stored in the computer memory in queues and the jobs are then executed one after the other according to order they were served. Because jobs can be prioritised, jobs with less priority can over stay without being executed.

3.4.3 Time-Sharing Mode

This is the mode of computer operations whereby a user is allocated a given time slice, typically some seconds, during which the user can do whatever he wants. Time sharing mode is a special multiprogramming mode which involves the sharing of time among all the users of a given computer. The computers are often located far away from the various users and the interconnected to them through telecom or data communication network. It is worthy of note that time sharing is an internal activity within the system unit.

3.5   Terminal

A terminal is an input/output that uses a keyboard for input and a monitor for output. The most common type of terminal is dumb. This terminal can only be used to receive information from a computer. An example of a dumb terminal is airline clerks at airport ticket and check – in counter. Another type of terminal is intelligent terminal where information can be processed using an in-built processor. Examples include automated teller machine and point of sale.

3.6   Teleprocessing

It is a process whereby computer are connected to the central processor by telecommunication network by special dedicated satellite links or microwave using a terminal located on a remote stations. Data and instructions inputs from each remote station are transmitted to the central processor and the result of the processing is transmitted back almost immediately.

4.0   CONCLUSION

The flow of information within an organisation is the strong force that draws the major economic stream of business. The configuration of computer determines the mode which it operates. The direction which information flows is the subject to communication mode.

5.0 SUMMARY

We have been able to put you through the modes of computer operations like stand alone, batch processing and time sharing modes; also, the different information communication modes such as simplex, half duplex and full duplex modes.

6.0 TUTOR-MARKED ASSIGNMENT

1. Explain the modes of computer operations.
2. What is teleprocessing?
3. Classify terminal.
4. Analyse the modes of information flows.

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MODULE 3   INFORMATION REPRESENTATION, STORAGE MEDIA AND SECURITY

Unit 1   Information Representation
Unit 2   Information Storage Media
Unit 3   Information Security

UNIT 1   INFORMATION REPRESENTATION

CONTENTS

1.0   Introduction
2.0   Objectives
3.0   Main Content
        3.1   ASCII Codes
        3.2   EBCDIC
        3.3   BCD
        3.4   Gray Code
        3.5   Excess 3- Code
4.0   Conclusion
5.0   Summary
6.0   Tutor-Marked Assignment
7.0   References/Further Reading

1.0   INTRODUCTION

This unit looks at the various ways information is being represented in computer system, both the way it is represented in the computer memory and in different application packages.

2.0   OBJECTIVES

At the end of this unit, you should be able to:

•   state five ways information is represented in the memory
•   explain the BCD equivalent of 18
•   analyse the use of a gray code and any other code.

3.0   MAIN CONTENT

Information is represented in a computer memory by means of binary sequences that are organised into computer words. Computer represents

information by one of two states, on or off. One on or off is known as bit, that is, binary digit.

A byte is a useful quantity in which to store information because it provides enough possible patterns to represent the entire alphabet, in lower and upper cases, as well as numeric digits, punctuation marks, and several character-sized graphics symbols, including non-English characters such as □. A byte also can be interpreted as a pattern that represents a number between 0 and 255. A kilobyte—1,024 bytes—can store about 1,000 characters; a megabyte can store about 1 million characters; a gigabyte can store about 1 billion characters; and a terabyte can store about 1 trillion characters.

Different formats exist in which information can be stored. They includes: ASCII, BCD, EBCDIC, Excess-3 codes, and Gray Code.

3.1   ASCII Codes

ASCII is acronym for American Standard Code for Information Interchange. ASCII provides for 256 codes divided into two sets— standard and extended—of 128 each. These sets represent the total possible combinations of either 7 or 8 bits, the latter being the number of bits in 1 byte. The basic, or standard, ASCII set uses 7 bits for each code, yielding 128 character codes from 0 through 127 (hexadecimal 00H through 7FH). The extended ASCII set uses 8 bits for each code, yielding an additional 128 codes numbered 128 through 255 (hexadecimal 80H through FFH).

In the standard ASCII character set, the first 32 values are assigned to communication and printer control codes—nonprinting characters, such as backspace, carriage return, and tab—that are used to control the way information is transferred from one computer to another or from a computer to a printer. The remaining 96 codes are assigned to common punctuation marks, the digits 0 through 9, and the uppercase and lowercase letters of the Roman alphabet.

The extended ASCII codes, 128 through 255, are assigned to variable sets of characters by computer manufacturers and software developers. These codes are not as interchangeable among different programmes and computers as are the standard ASCII characters. IBM, for example, uses a group of extended ASCII characters generally called the IBM extended character set for its personal computers; Apple Computer uses a similar but different group of extended ASCII characters for its Macintosh line of computers. Thus, whereas the standard ASCII character set is universal among microcomputer hardware and software,

extended ASCII characters can be interpreted correctly only if a programme, computer, or printer is designed to do so.

3.2   EBCDIC

EBCDIC is acronym for Extended Binary Coded Decimal Interchange Code. A coding scheme developed by IBM for use with its computers as a standard method of assigning binary (numeric) values to alphabetic, numeric, punctuation, and transmission-control characters. EBCDIC is analogous to the ASCII coding scheme more or less universally accepted in the micro-computing environment. It differs in using 8 bits for coding, thus allowing 256 possible characters (in contrast to the 7 bits and 128 characters in the standard ASCII set). Although EBCDIC is not widely used with microcomputers, it is well known and internationally recognised, primarily as an IBM code for the corporation's mainframes and minicomputers.

Extended ASCII code is an 8-bit code which adds graphic and math symbols to ASCII for a total of 256 symbols. Extended ASCII provides added capability by allowing for 128 additional characters, such as accented letters, graphics characters, and special symbols.

3.3   BCD

BCD implies binary coded decimal. It is used in the representation of the digits 0 to 9. Information for each decimal digit is represented by four-bit binary word. For other numbers greater than 9, a combination of the BCD codes of the digits present in the number is used.

Table 1: BCD Codes from 0 to 9

0	1	2	3	4	5	6	7	8	9
0000	0001	0010	0011	0100	0101	0110	0111	1000	1001

3.4   Excess 3- Codes

The name "Excess 3- code" signifies the operation carried to arrived on representation of the number. It implies that the code is derived by the addition of 3 (0011) to a BCD.

Table 2: Excess 3 Codes of 0 to 9

Decimal	0	1	2	3	4	5	6	7	8	9
BCD	0000	0001	0010	0011	0100	0101	0110	0111	1000	1001
Excess 3	0011	0100	0101	0110	0111	1000	1001	1010	1011	1100

3.5   Gray Codes

The Gray code's most important characteristic is that only one digit changes as you increment or decrement the count. The Gray code is commonly associated with input/output devices such as an optical encoder of a shaft's angular position.

Table 2: Gray Codes of 0 to 9

0	1	2	3	4	5	6	7	8	9
0000	0001	0011	0010	0110	0111	0101	0100	1100	1101

4.0   CONCLUSION

Computer only understand the machine language, which a binary language of zeros and ones (0s and 1s). So, to discuss how this information is represented in a computer system is a vital thing to do.

5.0   SUMMARY

We have looked into different information representation format starting from ASCII to BCD. Also discuss are gray codes, excess- 3 codes, and so many others.

6.0   TUTOR-MARKED ASSIGNMENT

- What is the BCD equivalent of 18?
- How many bits can be used to represent a single decimal digit using BCD?
- Where can a gray code be useful?
- A code gotten by addition of 0011 to BCD code is known as------ ----------------

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UNIT 2   INFORMATION STORAGE MEDIA

CONTENTS

1.0   INTRODUCTION

Storage units are memories required in a computer system to store large data, since the storage capacity of the main memory is limited. Also, it is costly to used main memory for mass storage, hence, unavoidable presence of disk/ secondary storage media.

2.0   OBJECTIVES

At the end of this unit, you should be able to:

- discuss the different storage media used in storing large volumes of data in organisations where management information system is involved
- identify the difference between seek time and data transfer rate
- list three standard storage capacity sizes that a flash disk can have.

3.0   MAIN CONTENT

3.1   Magnetic Tape

Magnetic tape is similar to the reel-to-reel audiocassette tape desk used for sound or film recording. The data are stored in tape in blocks with gaps between them to allow for stoppage and starts. Data is recorded onto or read from magnetic tapes using a device called magnetic tape unit. Magnetic tape served as a very efficient and reliable information storage media since the early 50s. Magnetic tape storage has the

advantage of holding enormous amounts of data; because of this, it is used to store information on the largest computer systems. The shortcomings of using magnetic tape are as follows:

i.   it has a very slow data access time when compared to other forms of storage media
ii.   access to information is sequential.

Like the surface on a magnetic disk, the surface of tape is coated with a material that can be magnetised. As the tape passes over an electromagnet, individual bits are magnetically encoded. Computer systems using magnetic tape storage devices employ machinery similar to that used with analogue tape: open-reel tapes, cassette tapes, and helical-scan tapes.

3.2   Floppy Disk

Floppy Disk, in computer science is a round, flat piece of Mylar coated with ferric oxide, a rust-like substance containing tiny particles capable of holding a magnetic field, and encased in a protective plastic cover, the disk jacket. Data is stored on a floppy disk by the disk drive's read/write head, which alters the magnetic orientation of the particles. Orientation in one direction represents binary 1and orientation in the other, binary 0. Typically, a floppy disk is 5.25 inches in diameter, with a large hole in the centre that fits around the spindle in the disk drive. Depending on its capacity, such a disk can hold from a few hundred thousand to over one million bytes of data. A 3.5-inch disk encased in rigid plastic is usually called a microfloppy disk but can also be called a floppy disk.

3.3   Magnetic Disk/Hard Disk

The hard disk is a computer device for storing large amount of data. It resides permanently within the system unit of every computer. All installed software packages occupies this storage unit. The storage capacity of a hard disk drive is measured in gigabyte (10^9 bytes), while the physical size is recorded in inches. Hard Disk is one or more inflexible platters coated with material that allows the magnetic recording of computer data. Hard disks provide faster access to data than floppy disks and are capable of storing much more information. Because platters are rigid, they can be stacked so that one hard-disk drive can access more than one platter. Most hard disks have from two to eight platters.

The disk drive is the motor that rotates the disk; the read-write mechanism and the logic board, receives commands from the operating system to place or retrieve information on the disk. To read or write information to a disk, drives use various methods. Floppy and hard drives use a small magnetic head to magnetise portions of the disk surface.

To write data to the disk, the read-write head creates a small magnetic field that aligns the magnetic poles of the particles on the surface of the disk directly beneath the head. Particles aligned in one direction represent a 0 while particles aligned in the opposite direction represent a 1. To read data from a disk, the drive head scans the surface of the disk. The magnetic fields of the particles in the disk induce an alternating electric current in the read-write head, which is then translated into the series of 1s and 0s that the computer understands.

Data stored in hard disk are organised as file for easy reference. Large programme whose sizes exceed that of the main memory are held in the archival store and brought in to over-write the previous portion in main memory.

3.4   Flash Disk

Flash disk is a removable, portable, flash memory based data storage device that works through the computer's Universal Serial Bus (USB) port. Flash disk is very portable due to smallish nature of the physical size.

The storage capacity of a Flash disk is regularised in the order of 128MB, 256MB, 512MB, 1GB e.t.c. Thus, the smallest type of flash (128MB) can store what eighty eight diskettes cannot finish.

3.5   CD-ROM

CD-ROM is acronym for compact disc read-only memory, a rigid plastic disk that stores a large amount of data through the use of laser optics technology. Because they store data optically, CD-ROMs have a much higher memory capacity than floppy disks that store data magnetically. However, CD-ROM drives, the devices used to access information on CD-ROMs, can only read information from the disc, and not write to it.

The underside of the plastic CD-ROM disk is coated with a very thin layer of aluminum that reflects light. Data is written to the CD-ROM by burning microscopic pits into the reflective surface of the disk with a

powerful laser. The data is in digital form, with pits representing a value of 1 and flat spots, called *land*, representing a value of 0. Once data is written to a CD-ROM, it cannot be erased or changed, and this is the reason it is termed read-only memory. Data is read from a CD-ROM with a low power laser contained in the drive that bounces light—usually infrared—off of the reflective surface of the disk and back to a photo-detector. The pits in the reflective layer of the disk scatter light, while the land portions of the disk reflect the laser light efficiently to the photo-detector. The photo-detector then converts these light and dark spots to electrical impulses corresponding to 1s and 0s. Electronics and software interpret this data and accurately access the information contained on the CD-ROM.

CD-ROMs can store large amounts of data and so are popular for storing databases and multimedia material. The most common format of CD-ROM holds approximately 630 megabytes. A regular floppy disk holds approximately 1.44 megabytes.

CD-ROMs and audio CDs are almost exactly alike in structure and data format. The difference between the two lies in the device used to read the data—either a CD-ROM player or a compact disc (CD) player. CD-ROM players are used almost exclusively as computer components or peripherals. They may be either internal (indicating they fit into a computer's housing) or external (indicating they have their own housing and are connected to the computer via an external port).

Both types of players spin the discs to access data as they read the data with a laser device. CD-ROM players only spin the disc to access a sector of data and copy it into main memory for use by the computer, while audio CDs spin throughout the time that the audio recording is read out, directly feeding the signal to an audio amplifier.

The most important distinguishing feature among CD-ROM players is their speed, which indicates how fast they can read data from the disc. A single-speed CD-ROM player reads 150,000 bytes of data per second. Double-speed (2X), triple-speed (3X), quadruple-speed (4X), six-time speed (6X), and eight-times speed (8x) CD-ROM players are also widely available.

Other important characteristics of CD-ROM players are *seek time* and *data transfer rate*. The seek time (also called the access time) measures how long it takes for the laser to access a particular segment of data. A typical CD-ROM takes about a third of a second to access data, as compared to a typical hard drive, which takes about 10 milliseconds (thousandths of a second) to access data. The data transfer rate measures

how quickly data is transferred from the disk media to the computer's main memory.

The computer industry also manufactures blank, recordable compact discs, called CD-Rs (compact disc-recordable), that users can record data onto for one-time, permanent storage using CD-R drives. Compact disc-rewriteable (CD-RWs) are similar to CD-Rs, but can be erased and rewritten multiple times.

4.0   CONCLUSION

It is no longer news that of the characteristics that differentiate a modern technology in this information age and the later technologies is the ability of the present technologies to possessed storage facility. This storage media especially as they concern computer system have been itemised and discussed in this unit.

5.0   SUMMARY

The storage media in discourse in this unit includes magnetic tape, floppy disk, compact disk, flash disk and magnetic disk.

6.0   TUTOR-MARKED ASSIGNMENT

1.   Write short notes on any three storage media in computer system.
2.   Explain the difference between seek time and data transfer rate.
3.   Mention any three standard storage capacity sizes that a flash disk can have.
4.   Disk and drive in computer system mean the same. True or False? Why?

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UNIT 3   INFORMATION SECURITY

CONTENTS

1.0   INTRODUCTION

Organisations information contained in computer files and disks need to be protected against malicious CITages and attacks from unscrupulous intruders. This is because information is a strategic resource which is exclusively used by staff and management of that organisation. This attacks which can be perpetrated through the environment, hardware or software disclose organisational information to unauthorised users hence exposing them to a lot of dangers. Computers and the information they contain are often considered confidential because they are restricted from a number of users.

2.0   OBJECTIVES

At the end of this unit, you should be able to:

- define and explain the concept of information security
- describe the different security measures
- state the threats to computer security.

3.0   MAIN CONTENT

3.1   Meaning of Computer Security

Computer security is a branch of technology known as information security. The objective of computer security includes protection of information and property from theft, corruption, modification or natural disaster while allowing the information to remain accessible and productive to its intended users. In other words, computer security is a technique developed to safeguard information and information processing tools in a computer from malicious users. Computers and the information they contain are often considered as confidential systems because their uses are typically restricted to a limited number of users. This confidentiality can be compromised in a variety of ways hence introducing threats to the computer. People who intentionally break through ones confidentiality are computer experts who are knowledgeable enough in information processing techniques and software programming. With the ever increasing use of computers in diverse application areas of human endeavours therefore has made computer security a global issue.

3.2   Threats to a Computer

With their increasing power and versatility, computers simplify day-to-day activities of life. Unfortunately, as computer use becomes more widespread, so do the opportunities for misuse. Computer hackers (people who illegally gain access to other peoples computer systems often violating privacy and tampering with, modifying or destroying records. Programmes called viruses or worms can replicate and spread from computer to computer, erasing information or causing system malfunctions. The various threats to a computer include the following:

3.2.1   Computer Virus

Computer viruses have been a problem for years and are still prevalent today. The common blunder people make when the topic of computer virus arises is to refer to a worm or Trojan horse as a virus. These words

which are normally used interchangeably do not exactly have the same meaning. Yet they are all malicious programs that can CITage your computer.

A computer virus is a computer program that can copy itself and infect a computer without the permission or knowledge of the owner. It attaches itself to a program or file enabling it to spread from one computer to another and leaving infections as it travels. A true virus can only spread from one computer to another when its host is taken to the target computer. For instance, if a user sent a virus over a network or carried it in a removable storage medium (floppy disk, compact disk (CD), digital video disk (DVD), or Universal Serial Bus (USB) drive (Flash)), it increases the chances of spreading to other computers by infecting files. Like a human virus, a computer virus may exist on your computer but it actually would not infect your computer unless you run or open the malicious program. At this point, it is important to note that a virus cannot be spread without a human action such as running an infected program or file to keep it going. People unknowingly continue the spread of computer virus by sharing infected files, removable storage devices and network resources.

In order to replicate itself, a virus must be permitted to execute codes and write to memory. For this reason, many viruses attach themselves to executable files that may be part of the legitimate programs. If the user attempts to run an infected program, the virus code may be executed simultaneously. Viruses can be divided into two types based on their behaviour when they are executed. They are:

(a)   **Non Resident Viruses:** These are viruses that immediately search for the hosts that can be infected, infects them and finally transfers control to the application program they infected. Hence they can be thought to have a finder module and a replication module. The finder module is responsible for finding new files to infect. Foe each executable file the finder module encounters, it calls the replication module to infect that file with a copy of itself.

(b)   **Resident Viruses:** These are viruses that do not search for hosts when they are started. Instead, a resident virus loads itself into the memory on execution and transfers control to the host program. The virus stays active in the background and infects new host when those files are accessed by other programs or the operating system itself. Resident viruses therefore contain a replication module similar to the one that is employed by non-resident viruses. This module is not called by a finder module.

The virus loads the replicating module into the memory when is executed instead and ensures that this module is executed each time the operating system is called to perform a certain operation. The replication module can be called for example each time the operating system executes a file. In this case, the virus infects every suitable program that is executed on the computer.

3.2.2   Computer Worms

A worm is similar to a virus by design. Worms are self replicating computer programs that use networks to send copies of it to other nodes (computers on networks) and may do so without intervention. Worms spread from computer to computer but unlike the virus, it has the capability to travel without any human action. A worm takes advantage of a file or information transport features on your system which is what allows it to travel unaided.

The biggest danger with a worm is its capability to replicate itself on your system. So, rather than your computer searching out a single worm, it would send out hundreds or thousands of copies of itself creating a huge devastating effect. One example would be for a worm to send a copy of itself to everyone listed in your e-mail address book. Then the worm replicates and sends itself out to every address listed in each of the receivers address book and the manifest continues. Due to the copying nature of worms and its capability to travel across networks, the end result in most cases is that the worm consumes too much system memory or network bandwidth causing network servers and individual computers to stop responding. In recent worm attacks such as the much dreaded Blaster worm, the worm has been designed to tunnel into your system and allow malicious users to control your computer from remote ends.

The main difference therefore between a computer virus and computer worm is that a virus is a set of computer programs that attaches itself to programs or files in other computers. The viruses are often parts of documents that are transmitted as attachments. On the other hand, a worm is similar to a virus but is a self contained program that replicates and transports itself from one computer to another.

3.2.3 Trojan Horse

A Trojan horse is as much trickish as the mythological Trojan horse it was named after. The Trojan horse is a destructive program disguised as a utility or application program. At first glance, it will appear to be useful software but will actually do something devious to the computer

once installed or run on the computer. Those on the receiving end of a Trojan horse are usually tricked into opening them because they appear to be receiving legitimate software files from legitimate sources. When a Trojan is activated on your computer, the results can vary. Some Trojans are designed to be more annoying than malicious like changing your desktop, adding silly active desktop icons or they can cause serious CITage by deleting files and destroying information on your system. Trojans are also known to create backdoor on your computer that gives malicious users access to your system possibly allowing confidential or personal information to be compromised. Unlike viruses and worms, Trojans do not reproduce by infecting other files nor do they self replicate.

3.2.4 Logic Bombs

This infects computers memory but unlike a virus, it does not replicate itself. A logic bomb delivers its instructions when triggered by specific conditions such as when a particular date or time is reached or when a combination of letters is typed on a keyboard. A logic bomb has the ability to erase a hard disk drive or delete certain files.

3.2.5 Computer Hackers

These are people who illegally gain access to computer systems and often violating privacy and tampering with or destroying records. Unfortunately computer hackers are experts that are totally engrossed in computer technologies. In 1980s, with the advent of personal computers and dial up computer networks, hackers acquired a pejorative connotation often referring to someone who secretively invades other people's computers, inspecting and tampering with the programs or data stored on them.

Furthermore, malicious hackers are increasingly developing powerful software, crime tools such as virus generators, Internet eavesdropping sniffers, password guessers, vulnerability testers and computer service saturators. For example, an Internet eavesdropping sniffers intercepts Internet messages sent to other computers. A password guesser tries millions of combination of characters in an effort to guess a computers password. Vulnerability testers look for software weaknesses. These crime tools are also valuable security tools for testing the security of computers and networks. Some hackers go beyond mere programming and take apart operating systems and programs to see what makes them tick.

3.2.6   Blended Threats

A blended threat is a more sophisticated attack that bundles some of the worst aspects of viruses, worms, Trojan horses and malicious program codes into one single threat. Blended threats can use server and Internet vulnerabilities (weaknesses) to initiate then transmit and also spread an attack. Characteristics of blended threats are:

- they cause harm to the infected system or network
- they propagate using multiple methods
- their attack could come from multiple points
- they exploit vulnerabilities.

To be considered a blended threat, the attack would normally serve to transport multiple attacks in one payload. For example, it wouldn't just launch a denial-of –service (DoS) attack; it would also for example install a backdoor and may even CITage a local system in one shot. DoS is an illegal attempt to put a computer out of action by overloading it with data from many sources simultaneously. Additional blended threats are designed to use multiple modes of transport. So while a worm may travel through e-mails easily, a single blended threat could use multiple routes including e-mail, file sharing network, etc.

Lastly, rather than a specific attack on a predetermined **.**exe file, a blended threat could do multiple malicious acts like modifying your files, Hypertext Markup Language (HTML) files and registry keys at the same time. This means that it can basically cause CITage within several areas of your network at the same tine. Blended threats therefore are considered to be the worst risk to security. Most blended threats also require no human intervention to propagate.

3.2.7 Hardware Failure/ Malicious CITage

Computer components (hardware) are subject to failure just as any other machine. The computer contains vital information that ought to be preserved. To ensure the sustenance of the component parts and the information they contain, one should be aware of the causes of hardware failure which could come from power supply, destruction of computer hardware (fire, flood, theft, etc), malicious CITage, etc. Malicious CITage of some component parts can be done by criminals who though are computer staff but intend to defraud the organisation poses a major security threat. To overcome this, appropriate authorisation, environmental security and backups would aid in reducing this threat.

3.3   Information Security Measures

Computers and the information they contain are often considered confidential systems because of its sensitivity. This confidentiality which can be compromised in a variety of ways can be curbed using a variety of security techniques. They include

3.3.1   Backup

Storing backup copies of software and data and having backup computer and communication capabilities are important basic safeguards because the data can then be restored if it was altered or destroyed by a computer crime or accident. This back up can equally be done on removable storage devices like floppy disks, compact disks (CD), digital convergence disk (DVD), USB flash, hard disks, etc. Computer data should be backed up frequently and should be stored nearby in secure locations in case of CITage at the primary site. Transporting sensitive data to storage locations should also be done securely.

3.3.2 Encryption

Another technique to protect confidential information is encryption. Encryption is a process of converting messages or data into a form that cannot be read without decrypting or deciphering it. The root of the word encryption—*crypt*—comes from the Greek word *kryptos*, meaning "hidden" or "secret." The study and practice of encryption and decryption is called the science of cryptography. Scientists who study different ways to protect and ensure the confidentiality, integrity, and authenticity of information are called cryptologists. Cryptologists also engage in cryptanalysis to find ways to break encryption methods.

Encryption uses a step-by-step procedure called an algorithm to convert data or the text of an original message, known as plaintext, into cipher text, that is its encrypted form. Cryptographic algorithms normally require a string of characters called a key to encrypt or decrypt data. Those who possess the key and the algorithm can encrypt the plaintext into cipher text and then decrypt the cipher text back into plaintext. Computer users can scramble information to prevent unauthorised users from accessing it. Authorised users can unscramble the information when needed by using a secret code called a key. Without the key the scrambled information would be impossible or very difficult to unscramble. A more complex form of encryption uses two keys, called the public key and the private key, and a system of double encryption. Each participant possesses a secret, private key and a public key that is known to potential recipients. Both keys are used to encrypt, and

matching keys are used to decrypt the message. However, the advantage over the single-key method lies with the private keys, which are never shared and so cannot be intercepted. The public key verifies that the sender is the one who transmitted it. The keys are modified periodically, further hampering unauthorised unscrambling and making the encrypted information more difficult to decipher.

Cryptologists engage in an unending competition to create stronger cryptographic techniques and to break them. Many recent cryptography techniques are nearly unbreakable even with the most powerful computers. These systems produce cipher text that appears to be random characters. These systems resist most existing methods for deciphering back into plaintext. The many different types of new cryptosystems use highly complex mathematical language and resist breaking even though cryptologists may know the techniques used in creating them. Three of the most popular cryptography systems used are the Data Encryption Standard (DES), Pretty Good Privacy (PGP), and the Rivest, Shamir, Adleman (RSA) system. DES uses a single key for both encrypting and decrypting. It was developed by International Business Machines Corporation (IBM) and approved by the United States National Institute of Standards and Technology in 1976. The Rivest, Shamir, Adleman (RSA) algorithm is a popular encryption method that uses two keys. It was developed for general use in 1977 and was named for the three computer scientists—Ronald L. Rivest, Adi Shamir, and Leonard Adleman—who originated it. The RSA Data Security Company has been highly successful in licensing its algorithm for others to use. PGP is an encryption system that also uses two keys. It is based on the RSA algorithm. PGP was invented by software developer Philip Zimmerman and is one of the most common cryptosystems used on the Internet because it is effective, free, and simple to use. PGP is such an effective encryption tool that the United States government sued Zimmerman for releasing it to the public, alleging that making PGP available to enemies of the United States would endanger national security. The lawsuit was dropped, but it is still illegal in some countries to use PGP to communicate with people in other countries.

3.3.3 Approved Users

Another technique to help prevent abuse and misuse of computer data is to limit the use of computers and data files to approved persons. Security software can verify the identity of computer users and limit their privileges to use, view, and alter files. The software also securely records their actions to establish accountability. Military organisations give access rights to classified, confidential, secret, or top-secret information according to the corresponding security clearance level of

the user. Other types of organisations also classify information and specify different degrees of protection.

3.3.4 Passwords

These are confidential sequences of characters that allow approved persons to make use of specified computers, software, or information. To be effective, passwords must be difficult to guess and should not be found in dictionaries. Effective passwords contain a variety of characters and symbols that are not part of the alphabet. To thwart impostors, computer systems usually limit the number of attempts and restrict the time it takes to enter the correct password.

A more secure method is to require possession and use of tamper-resistant plastic cards with microprocessor chips, known as "smart cards," which contain a stored password that automatically changes after each use. When a user logs on, the computer reads the card's password, as well as another password entered by the user, and matches these two respectively to an identical card password generated by the computer and the user's password stored in the computer in encrypted form. Use of passwords and 'smart cards' is beginning to be reinforced by biometrics, identification methods that use unique personal characteristics, such as fingerprints, retinal patterns, facial characteristics, or voice recordings.

3.3.5 Firewalls

A firewall is a system that prevents unauthorised use and access to your computer. A firewall can be either hardware or software. Hardware firewalls provide a strong degree of protection from most forms of attack coming from the outside world and can be purchased as a stand-alone product or in broadband routers. Unfortunately, when battling viruses, worms and Trojans, a hardware firewall may be less effective than a software firewall, as it could possibly ignore embedded worms in outgoing e-mails and see this as regular network traffic.

For individual home users, the most popular firewall choice is a software firewall. A good software firewall will protect your computer from outside attempts to control or gain access your computer, and usually provides additional protection against the most common Trojan programmes or e-mail worms. The downside to software firewalls is that they will only protect the computer they are installed on, not a network. It is important to remember that on its own a firewall is not going to rid you of your computer virus problems, but when used in conjunction with regular operating system updates and a good anti-virus scanning

software, it will add some extra security and protection for your computer or network. Computers connected to communication networks, such as the Internet, are particularly vulnerable to electronic attack because so many people have access to them. These computers can be protected by using firewall computers or software placed between the networked computers and the network. The firewall examines, filters, and reports on all information passing through the network to ensure its appropriateness. These functions help prevent saturation of input capabilities that otherwise might deny usage to legitimate users, and they ensure that information received from an outside source is expected and does not contain computer viruses.

3.3.6 Intrusion Detection Systems

Security software called intrusion detection systems may be used in computers to detect unusual and suspicious activity and, in some cases, stop a variety of harmful actions by authorised or unauthorised persons. Abuse and misuse of sensitive system and application programmes and data such as password, inventory, financial, engineering, and personnel files can be detected by these systems.

3.3.7 Application Safeguards

The most serious threats to the integrity and authenticity of computer information come from those who have been entrusted with usage privileges and yet commit computer fraud. For example, authorised persons may secretly transfer money in financial networks, alter credit histories, sabotage information, or commit bill payment or payroll fraud. Modifying, removing, or misrepresenting existing data threatens the integrity and authenticity of computer information. For example, omitting sections of a bad credit history so that only the good credit history remains violates the integrity of the document. Entering false data to complete a fraudulent transfer or withdrawal of money violates the authenticity of banking information. These crimes can be prevented by using a variety of techniques. One such technique is *checksumming*. Checksumming sums the numerically coded word contents of a file before and after it is used. If the sums are different, then the file has been altered. Other techniques include digital signatures, cyclic redundancy checks, authenticating the sources of messages, confirming transactions with those who initiate them, segregating and limiting job assignments to make it necessary for more than one person to be involved in committing a crime, and limiting the amount of money that can be transferred through a computer.

3.3.8 Disaster Recovery

Organisations and businesses that rely on computers need to institute disaster recovery plans that are periodically tested and upgraded. This is because computers and storage components such as diskettes or hard disks are easy to CITage. A computer's memory can be erased or flooded with irrelevant information, fire, or other forms of destruction can CITage the computer's hardware. Computers data and components should be installed in safe and locked facilities.

4.0   CONCLUSION

Computer security is an important concept considered in the usage of any computer system either as a stand- alone computer or in a network. It is critical in almost all technology driven industry which operates on computer systems.

5.0   SUMMARY

The topics covered in this unit ranges from the rudimentary understanding of what computer and information security is all about to those factors that constitutes a threats to computer and information stored in it. We also discussed in detail the measures to combat these threats.

6.0   TUTOR-MARKED ASSIGNMENT

1.   What is computer security and why are portions of organisational budgets spent on managing information.
2.   The use of removable storage media in various computers and networks increases the chances of spreading the virus.
3.   Differentiate between the resident and non resident viruses.
4.   Differentiate between a computer worm and the Trojan Horse.
5.   What is a blended threat and why is it referred to as the most dangerous?
6.   Briefly explain the three most popular cryptography systems.

7.0   REFERENCES/FURTHER READING

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