# COURSE GUIDE

**COURSE GUIDE**
**BUS401**

**MANAGEMENT INORMATION SYSTEM**


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|---|---|
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## 1.0 Introduction

The course Management Information System (BUS 401) is a core course which carries three (3) credit units. It is prepared and made available to all undergraduate students in the Business Administration Programme, in the Faculty of Management Sciences/Department of Administration. This course is useful material to you in your academic pursuit as well as in your workplace as managers and administrators.

## 2.0 What you will Learn in this Course

The course is made up of twenty-one (21) units, covering areas such as;

- Introduction to, and fundamental of Data Processing- brief history and conventional data processing methods;
- Manual methods and mechanized methods.
- Classification of systems and their relative merits.
- Closed loop and open loop systems: effect on time-lag; the total system approach and objectives; total systems and subsystems.
- Data capturing, reporting devices, storage devices and file organization
- Data base processing; tools for creating data processing; visual and event programming; system classification; file processing.
- IT Architects and Infrastructure; Electronic Commerce –merits/demerits and technological changes; guidelines for information and communication technology in Nigeria.
- Globalization and International Institutions

The Course Guide is meant to provide you with the necessary information about the course, the nature of the materials you will be using and how to make the best use of them towards ensuring adequate success in your programme as well as the practice of management information system in the society. Also included in this course guide is information on how to make use of your time and information on how to tackle the tutor-marked assignment (TMA). There will be tutorial sessions during which your facilitator will take you through your difficult areas and at the same time have meaningful interaction with your fellow learners.

## 3.0 Course Contents

The course consists of;

- Introduction to, and fundamental of Data Processing- brief history and conventional data processing methods;
- Manual methods and mechanized methods.
- Classification of systems and their relative merits.
- Closed loop and open loop systems: effect on time-lag; the total system approach and objectives; total systems and subsystems.
- Data capturing, reporting devices, storage devices and file organization
- Data base processing; tools for creating data processing; visual and event programming; system classification; file processing.
- IT Architects and Infrastructure; Electronic Commerce –merits/demerits and technological changes; guidelines for information and communication technology in Nigeria.
- Globalization and International Institutions

## 4.0 Course Aims

The main aim of this course is to arm you with adequate information on the concept and nature of Management Information System, its components and its roles in businesses and the society as a whole. The course also aims at making you have a greater understanding of the fundamentals of Data processing, capturing, file processing, Electronic Commerce and the role of MIS in Globalization.

## 5.0 Course Objectives

After completing this course, you should be able to;

- Understand the Introduction to and fundamentals of Data Processing- its brief history and conventional data processing methods
- Identify the Manual methods and mechanized methods of Data processing.
- Explain the Classification of systems and their relative merits.
- Understand the Closed loop and open loop systems: its effect on time-lag; the total system approach and objectives; total systems and subsystems.
- Describe Data capturing, reporting devices, storage devices and file organization
- Discuss Data base processing; tools for creating data processing; visual and event programming; system classification; file processing.
- Explain IT Architects and Infrastructure; Discuss Electronic Commerce –merits/demerits and technological changes; guidelines for information and communication technology in Nigeria.
- Discuss the effects of MIS on Globalization and International Institutions

## 6.0 Course Materials

Major components of the course are;

- Course Guide
- Study Units
- Textbooks
- Assignment Guide

## 7.0 Study Units

There are four modules of 21 units in this course, which should be studied carefully.

**Module 1;**

Unit 1: Introduction to Management Information System

Unit 2: The Scope of Data Processing

Unit 3: Basic Hardware Components and Memory

Unit 4: Basic software for Data Processing

**Module 2;**

Unit 5: Data Capturing and Reporting Devices

Unit 6: Data Storage Devices

Unit 7: File Organization

Unit 8: Data Processing Technique

Unit 9: Traditional File System Processing

**Module 3;**

Unit 10: Data Base Processing

Unit11: Data Processing Personnel

Unit12: Tools for Creating Data Processing

Unit 13: Visual and Event Programming

Unit 14: System

Unit 15: System Classification

Unit 16: File Processing

**Module 4;**

Unit 17:  IT Architects and IT Infrastructure

Unit 18: Electronic Commerce

Unit 19: E-commerce Merits, Demerits and Technological Changes

Unit 20: Guidelines for Information and Communication Technology in Nigeria

Unit 21: Globalization/International Institutions

## 8.0 Assignment

There are many assignments in this course and you are expected to do all of them by following the schedule prescribed for them in terms of when to attempt them and submit same for grading your Tutor.

## 9.0 Tutor-Marked Assignments (TMAs)

You are expected to submit all the TMAs to your Tutor for grading on or before the stated 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 may not be granted after the deadline, unless on exceptional cases. The TMAs usually constitute 30% of the total score for the course.

## 10.0 Final Examination and Grading

At the end of the course, you will write the final electronic examination. It will attract the remaining 70%. This makes the total final score to be 100%.

**11.0 Conclusion**

This course, Management Information System (ENT240) exposes you to issues and components involved in management information system, and its roles in businesses and the global market. On the successful completion of the course, you will have been armed with materials, expertise and skills necessary for utilizing an information system in the operations of a business.

**COURSE MATERIAL**
**BUS401**

**MANAGEMENT INORMATION SYSTEM**


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## MAIN CONTENT

**MODULE 1;**

UNIT 1: INTRODUCTION TO MANAGEMENT INFORMATION SYSTEM

UNIT 2: THE SCOPE OF DATA PROCESSING

UNIT 3: BASIC HARDWARE COMPONENTS AND MEMORY

UNIT 4: BASIC SOFTWARE FOR DATA P RO CESSING

**MODULE 2;**

UNIT 5: DATA CAPTURING AND REPORTING DEVICES

UNIT 6: DATA STORAGE DEVICES

UNIT 7: FILE ORGANI ZATION

UNIT 8: DATA PROCESSING TECHNIQUE

UNIT 9: TRADITIONAL FILE SYSTEM PROCESSING

**MODULE 3;**

UNIT 10: DATA BASE PROCESSING

UNIT11: DATA PROCESSING PERSONNEL

UNIT12: TOOLS FOR CREATING DATA PROCESSING

UNIT 13: VISUAL AND EVENT PROGRAMMING

UNIT 14: SYSTEM

UNIT 15: SYSTEM CLASSIFICATION

UNIT 16: FILE PROCESSING

**MODULE 4;**

UNIT 17:  IT ARCHITECTS AND IT INFRASTRUCTURE

UNIT 18: ELECTRONIC COMMERCE

UNIT 19: E-COMMERCE MERITS, DEMERITS AND TECHNOLOGICAL CHANGES

UNIT 20: GUIDELINES FOR INFORMATION AND COMMUNICATION TECHNOLOGY IN NIGERIA

UNIT 21: GLOBALIZATION/INTERNATIONAL INSTITUTIONS

**MODULE 1;**

UNIT 1: INTRODUCTION TO MANAGEMENT INFORMATION SYSTEM

UNIT 2: THE SCOPE OF DATA PROCESSING

UNIT 3: BASIC HARDWARE COMPONENTS AND MEMORY

UNIT 4: BASIC SOFTWARE FOR DATA P RO CESSING

## UNIT 1: INTRODUCTION TO MANAGEMENT INFORMATION SYSTEM

**CONTENTS**



### 1.0 INTRODUCTION

Information technology (IT) has vast potential for both good and bad uses in our society. This fact offers fruitful grounds for discussing issues such an individual's right to privacy versus the right of an organization to collect data on customer and employees, the means used to gather the data, the ethical use of information which has been collected, and other similar issues. Also, IT offers an organization the means of accomplishing its business with highly increased efficiency, but it often results in rapid change with which employees and suppliers must deal.

The course deals with the management of information technology and how best to develop systems to meet organizations needs. Issues of change and the regulation of the undesirable consequences of this change are covered. The difficulty of writing realistic regulations to deal with a continuously and rapidly changing area is also considered in the course. The questions of regulation also include the practices of companies that by their very products put them in a strong and perhaps monopolistic position in their industry.

### 2.0 OBJECTIVES

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

- discuss Information technology
- Identify various use in information management system in today business

- Understand the dynamics of information system

## 3.0 MAIN CONTENT

### 3.1MANAGEMENT INFORMATION SYSTEM (MIS)

Management Information Systems (MIS) focus on the use of Information and Communication Technologies (ICT) in managing organizations. In the 21st century almost all organizations use Information and Communication Technologies to efficiently manage their operations, to help managers make better decisions and achieve competitive advantage, and to facilitate seamless internal and external communications with their employees, customers, partners, and other stakeholders.

### 3.2 Businesses Pre-Information Systems

Until the 1990s, before the widespread adoption of personal computers and the Internet, companies were using information systems to manage data processing and record-keeping activities associated with business transactions like maintaining the general ledger (book keeping), payroll, billing, inventory management, etc. The focus was mainly on maintaining files and databases related to day-to-day operations. Communications, both internal and external, relied on paper, telephone, faxes, and other analog media. Information systems have evolved over the last 40 years, including the move from the mainframe computer of the 1970s to personal computers becoming an integral part of the tracking and organizational process in the 1980s. The arrival of the mainstream internet in the 1990s expanded business capabilities and the role of information systems to a global system of interaction.
Today, the main focus of companies is to stay globally competitive by leveraging the capabilities of modern information and communication technologies (ICT). Companies can use ICT to provide products & services of the highest quality at affordable prices and top-rated customer service, and help the companies to enter new markets through e-commerce. Globalization, collaboration, and integration have become the new drivers in this competitive arena. To remain competitive, companies are investing in modern information systems like Enterprise Resource Planning (ERP) software, which integrate the different functional areas of the business, and provide consistent real-time data for fast decision making. ERP systems help companies manage their operations seamlessly across the globe.

### 3.3 Companies' Modern Day Use of Information Systems

In the past when a company received a customer order, whether it was for a service requested or for a product purchased, the order needed to go through a process of paper-based workflow that was passed along to different departments, inbox-to-inbox. Throughout this process, the order often had to be re-typed as it passed through various departments, increasing the potential for human error. There was no accurate account order status because there was no official tracking device to alert each department. In order to retrieve order status information, customers were frequently directed to contact the company's warehouse for manual research!

Today, companies have eliminated the inaccuracy of paper-based tracking by implementing ERP systems. In a recent study conducted by Panorama Consulting Solutions, 63 percent of companies used their ERP software to eliminate inefficiencies in processes such as order tracking. Instead of standalone computer systems, ERP uses a unified program that links various functional departments such as finance, HR, manufacturing, warehouse, planning, purchasing, inventory, sales, and marketing. While each department may have its own set of software modules, the software is interconnected so that information can be shared throughout the organization. Once one department is finished updating and processing the order, it is automatically routed to the next department so that everyone is alerted to changes made.

**SELF ASSESSMENT EXERCISE**

**a)** Summarize the Modern day Use of Information System
**b)** Define information technology.

### 3.4 Adopting the Global Market

Many businesses have begun to participate in the global market, as it presents a chance for greater revenue and larger business prospects.
Already, the global information systems market has seen consistent demands from several businesses. The challenges vary depending on the size of businesses. For smaller businesses, controlling operations and storing information are less complicated. As businesses grow, especially those intersecting with global relations, information systems are used to manage operations accurately without growing the number of employees. The growing supply chains require that software solutions be used in the following sectors:

- Web-based ordering
- Customer relationship management
- Product configuration

### 3.5 The Future of Information Systems

As companies try to reduce costs, improve productivity, employers are looking to ERP systems to help them grow and remain competitive globally. Information systems have enhanced productivity for businesses. A career in managing information systems is ideal for those looking to advance in a Fortune 500 company. As businesses and organizations today require more and more technical skills, companies are looking for employees who will help manage and operate the various information-based tools.

### 3.6 Fundamental Roles of Management Information Systems in Business-Decision Making

Organizations strive to be market leaders in their given industry. In climates where factors such as recession, inflationary pressures and increased competition can hinder the achievement of this goal, companies look for strategies that lead to competitive advantages. One such strategy is the adoption of information systems within the company. Information systems help a company make adequate use of its data, reduce workload and assist with compliance with various mandatory regulations. The roles include:

**Information Storage and Analysis**
At the date of publication, many companies no longer manage their data and information manually with registers and hard-copy formats. Through the adoption of information systems, companies can make use of sophisticated and comprehensive databases that can contain all imaginable pieces of data about the company. Information systems store, update and even analyze the information, which the company can then use to pinpoint solutions to current or future problems. Furthermore, these systems can integrate data from various sources, inside and outside the company, keeping the company up to date with internal performance and external opportunities and threats.

**Assist with Making Decisions**
The long-term success of a company depends upon the adequacy of its strategic plans. An organization’s management team uses information systems to formulate strategic plans and make decisions for the organization's longevity and prosperity. The business uses information systems to evaluate information from all sources, including information from external references such as Reuters or Bloomberg, which provide information on the general economy. This analysis of and comparison to market trends helps organizations analyze the adequacy and quality of their strategic decisions.

**Assist with Business Processes**

Information systems aid businesses in developing a larger number of value added-systems in the company. For example, a company can integrate information systems with the manufacturing cycle to ensure that the output it produces complies with the requirements of the various quality management standards. Adoption of information systems simplifies business processes and removes unnecessary activities. Information systems add controls to employee processes, ensuring that only users with the applicable rights can perform certain tasks. Further, information systems eliminate repetitive tasks and increase accuracy, allowing employees to concentrate on more high-level functions. Information systems can also lead to better project planning and implementation through effective monitoring and comparison against established criteria.

**Considerations**

Implementing information systems within an organization can prove to be costly. Implementation costs include not only installation of the systems but also employee training sessions. In addition, employees may see the adoption of information systems as an unwarranted change and, thus, may resist this change. Resistance to change can hinder business operations and can cause employee turnover. Companies should have leadership in place to assess the adequacy of the decision to have an information system and to guide the company through the transition phase and weigh information systems cost against the potential benefits.

## 4.0 Conclusion

In this unit you have learn, the potential of Information Technology, Management Information System, Required Pre-information Systems and Fundamental Roles of Management Information system in making business decisions. The unit therefore served as introductory aspect to core Management Information system which covers commercial and technology academic areas.

## 5.0 SUMMARY

Management Information Systems (MIS) focus on the use of Information and Communication Technologies (ICT), It help managers make better decisions and achieve competitive advantage, and to facilitate seamless internal and external communications with their employees, customers, partners, and other stakeholders. It usefulness in modern day business is endless as its play crucial role in medical determination of unborn baby sex, health status and giving last result on post mortal death.

## 6.0 TUTOR-MARKED ASSIGNMENT

**1) Explain Businesses Pre-Information Systems.**

**2) What are the roles of Management Information Systems in Business-Decision Making?**

## 7.0 REFERENCES/FURTHER READINGS


1. The Role of International System in Running 21ts Century, Organization. ‘ The University of Scranton’. 1945, Zueiner allgemeinen Systemlehre, Blätter für deutsche Philosophie, 3/4. (Extract in: Biologia General is, 19 (1949), 139–164.
2. 1948, Cybernetics: Or the Control and Communication in the Animal and the Machine. Paris, France: Librairie Hermann & Cie, and Cambridge, MA: MIT Press. Cambridge, MA: MIT Press.
3. 1956. An Introduction to Cybernetics, Chapman & Hall.

## UNIT 2: THE SCOPE OF DATA PROCESSING

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### 1.0 Introduction

The word data refers to raw facts about and object. Data is meaningless until it subjected to manual or electronic processing by a computer to produce information used for decision making. Computers are used to process data because of their speed, reliability and other functionalities they offer. Computers can be distinguished by their sizes, types and generation.

### 2.0 Objectives

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

- Define and explain the terms; data and information
- Describe a computer system
- Explain the meaning of data processing
- Distinguish between the different types of computer
- Describe the basic operations of a computer
- List some benefits of using computer in business

### 3.1 Data and Information

Data exist in a variety of forms such as numbers or text on pieces of paper, as bytes in computer memory or as facts stored in a person's mind. Data is the plural form of the word datum and refers to basic facts about an object. An object refers to a person, place, or a thing. Data consist of numbers, words, images, etc. Data is meaningless until it undergoes some forms of processing. The outcome of a processed data is information. Although the word data and information are often used interchangeably, there is an important distinction between them. In the strictest sense, data consist of the raw number that computers process to produce information. Data can be looked at as facts out of context. Table 1 captures basic facts about a matriculated student of National Open University of Nigeria. The data items consisting of Matriculation Number, Name, School, Department, Centre, Banker, Status and e-Email are used to hold the students details.

| S/no | Data item | Actual Details or value |
|---|---|---|
| 1 | Matriculation Number | NOU050010999 |
| 2 | Name | Adebayo Musa, Ada |
| 3 | School | Science and Technology |
| 4 | Department | Computer Science |
| 5 | Centre | Lagos |
| 6 | Banker | Zenith Bank |
| 7 | Status | Returning |
| 8 | e-mail | ama@nou.edu.ng |

**Table 1: Student Registration**

Similarly, a commercial bank may request for the following data before the same student can operate an account or enjoy some banking services

| S/no | Data item | Actual Detail or value |
|---|---|---|
| 1 | Matriculation Number | NOU050010999 |
| 2 | Name | Adebayo, Musa, Ada |
| 3 | Date of Birth | 14th April, 1970 |
| 4 | Nationality | Nigerian |
| 5 | Sex | Male |
| 6 | Occupation | Student |
| 7 | School | National Open University |
| 8 | Matriculation Number | NOU050010999 |

**Table 2: Student Account**

The details of this student (Adebayo Musa, Ada) if treated independently may not have specific meanings until it is subjected to some manual or computerized processing. The raw data in the tables may be further processed by a human or input into a computer, stored, processed and transmitted (output) to another human or a computer. A typical data processing function will be to locate a student record or data from a large file based on matriculation number. If this is to be carried out manually a lot of time and efforts will be required by the data processing personnel. When the method of data processing is manual, it is called manual data processing. On the other hand, when the method of processing is electronic we refer to it as electronic data processing. Computers are used to turn meaningless data by processing them into useful information, such as spreadsheet,
graphs, and reports. In short, information is defined as either a meaningful answer to a query or a meaningful stimulus that can cascade into further queries. For example, with the data in table1 and table 2, the bank official may be interested in the number of students from each school that have subscribed to a particular

service its offers. In which case, a query will be run on the existing database. The result of the query will provide information which will help the management of the bank to discontinue or continue with the service. Some characteristics of information are: relevance, accuracy, conciseness, timeliness, and completeness.

### 3.2 Electronic Data Processing Systems

Electronic Data processing (DP) is any computer automated process that converts raw facts i.e data into output i.e useful information. Data becomes more useful only when they have undergone some computer processing and well-presented to allow for decision making. Data processing systems have become indispensable in managing information in modern day organizations. In recent times, data processing systems are quite often referred to as information systems to highlight their practicality. All the same, both terms are more or less the same, performing similar functions; data processing systems typically manipulate raw figures into information, and likewise information systems usually take raw figures as input to generate useful information as output. In many organizations, these systems exist as payroll systems, sales and marketing systems, finance and accounting systems, manufacturing and production system, human resources systems, University management systems etc. Also, the term data processing can apply to any process of transforming data into information and also the converting of information back to data.

### 3.3 The Scope of Data Processing System

Conventional usage of the terms data processing and information systems restricts their use to refer to the algorithmic derivations, logical deductions, and statistical calculations that recur perennially in general business environments, rather than in the more expansive sense of all conversions of real-world measurements into real-world information. In the real sense, although, data processing requires the use of computers, the level of computerizations is usually not too computing intensive as ma y be expected in scientific and engineering applications. Computing is a term restricted to number crunching that is arithmetical calculations. These include adding, multiplying, subtracting and dividing, and exponentiation (raising numbers to specific powers) etc. The basic data processing operations performed on business data include the following:

- Data Collection
- Data Capture
- Data Recording
- Data Entry
- Data Transmission
- Data Sorting
- Updating of Information
- Adding of Data
- Deletion of information
- Data Validation
- Data Verification
- Summarizing of data
- Printing of Results
- Summaries of data for management decision
- Calculating data
- Sorting data
- Classifying data
- Summarizing data
- Comparing data
- Statistical reports
- Data Mining

Thus, data processing consist of those activities concerned with the systematic recording, sorting, computing, modifying, reporting displaying and printing of details relating to business transactions. While a data processing system can therefore be viewed as an administrative system superimposed upon the physical

business systems such as banking, engineering, insurance etc. The ultimate goal of data processing is to obtain information with which to control financial and administrative aspects of the business. In addition, managers and administrators with up-to-date information are able to make good decision that will positively affect the growth of organization.

### 3.4 Computer Systems

A computer is a device which given a set of instructions or data can be used to perform given task or tasks. Also, a computer can be referred to as a programmable, multi-user device that accepts data, raw facts and figures, and processes, or manipulates, it into useful information Computer are used primarily to speed up the problems solving and increase the overall productivity of its users. The computer reads in data and instructions, does some processing, and stores or outputs desired results. The computer is designed with input mechanism for reading data into the computer, internal storage facilities, and mechanisms for communicating with the outside world (output for writing data out.) In order for data to be processed by a computer, the data needs first to be converted into a machine readable format. Once data is in digital format, various procedures can be applied on the data to get useful information.

#### 3.4.1 Computer Generation

The history of computer development is often referred to in reference to the different generations of computing devices. Computer can be distinguished by these generations since each generation is characterized by a major technological innovation that fundamentally affected the way computers operate, resulting in smaller sized, cheaper, more powerful and more reliable systems

**First Generation 1940-1956**

The first computers used vacuum tubes for circuitry and magnetic drums for memory, and were often enormous, taking up a large space. They were very expensive to operate and maintain. In addition to using a great deal of electricity, they generated a lot of heat and were unreliable. First generation computers allowed programming in machine language to perform operations, and they could only solve one problem at a time. Input was based on punched cards and paper tape, and output was displayed on printouts. Common examples are The UNIVAC and ENIAC.

**Second Generation 1956-1963**

In this generation of computers, transistors were used in placed of vacuum tubes. The transistor was far superior to the vacuum tube, allowing computers to become smaller, faster, cheaper, more energy-efficient and more reliable than their first-generation computers. This generation of computer relied on punched cards for input and printouts for output. This generation of computers supported the use of assembly, languages - this allowed programmers to specify instructions in words.

**Third Generation - 1964 -1971**

Third generation computers used integrated circuits. Transistors were miniaturized and placed on silicon chips, called semiconductors, which drastically increased the speed and efficiency of computers. This invention led to the widespread use of computers today. Instead of punched cards and printouts, users interacted with third generation computers through keyboards and monitors and interfaced with an operating systems , which allowed the device to run many different applications at one time with a central program that monitored the memory. High-level programming languages such as early versions of COBOL and FORTRAN were used on these systems.

**Fourth Generation - 1971-Present**

The microprocessor brought the fourth generation of computers, as thousands of integrated circuits were built onto a single silicon chip. Fourth generation computers use microprocessor chips, which are large-scale integrated circuits containing thousands of transistors. The microprocessor led to the creation of the first personal computer. What in the first generation filled an entire room could now fit in the palm of the hand. As these small computers became more powerful, they could be connected to form networks, which

eventually led to the development of the Internet. Fourth generation computers also saw the development of Graphical Users Interface, the pointer devices such as mouse and personal digital assistants.

**Fifth Generation - Present and Beyond: Artificial Intelligence**
Fifth generation computing devices, based on artificial intelligence, are still in development. However, applications such as voice recognition are gradually coming into the market. The use of parallel processing and superconductors is helping to make artificial intelligence a reality. One of the goals of the fifth-generation computing is to develop devices that respond to natural language input. Computers are available in different categories of size, type and capabilities.

### 3.4.2 Analog and Digital Computer
Early attempts at manufacturing computers used analog techniques, but accuracy, speed and reliability were not very acceptable. Data processed by the computer can be described in tow forms: analog or digital. These two forms give an insight to a way of classifying computers today. Computing devices are classified as Analog or Digital according to the means by which they represent data.

#### 3.4.2.1 Analog Computers
Analog refers to non-digital (non-computer-based), continuous variable forms of data transmission, including voice and video. An analog computer represents a datum as a voltage, distance, position, or other physical quantity. Analog - continuously varying in strength and /or quantity. For example, sound, light, temperature, and pressure values can fall anywhere along a continuum or range. Examples of analog devices are a thermometer, a speedometer, a clock (with hour, minute, and second hands that sweep around the dial), and a pressure sensor, which can measure continuous fluctuation.

#### 3.4.2.2 Digital Computers
The term digital describes any system based on discontinues data or events. For example, electricity is either turned on or turned off. With a two-state on /off arrangement, one state can represent a 1 digit, and the other a 0 digit. Because computers are based on on / off or other two-state conditions, they use the binary system, which is able to represent any number using only two digits 0 and 1. Binary means having two components, alternatives, or outcomes. With this kind of arrangement digital data then, consist of data represented by on/off signal symbolized as 0s and 1s. A digital computer represents a datum as a sequence of symbols drawn from a fixed alphabet. The most common digital computers use a binary alphabet, that is, an alphabet of two characters, typically denoted "0" and "1". Digital computers are more common than analog computers. Digital
computer exist in different categories of sizes such computes as mainframes, minicomputers, microcomputers, workstations and supercomputers.

**Mainframe**
A mainframe is the largest and relatively most powerful computer, a powerhouse with large storage and very rapid processing power and speed. It is used for very large amount of business, scientific and engineering, military data. They are found in many data processing centers such as in Banks, military, airports, nuclear stations, universities, and other organizations where large amount of data are processed.

**Minicomputer**
A minicomputer is a mid-range, multi-purpose computer, about the size of an office desk produced by a number of manufacturers including Dell, Hewlett Packard, and IBMC often used in universities, factories, and research laboratories. Applications processed on minicomputers include, Accounting routines, banking, examination processing, hospital management systems, databases, geographical information systems and other management information systems. Some training or professionals certifications ma y be required to handle these systems compared to the operations of microcomputers.

**Microcomputers**

Microcomputers are sometimes referred to as personalcomputers (PCs). They are the computers that can be placed on desktops or carried fromroom to room. Some manufacturers of microcomputers include: IBM, Dell, Hewlett Packard, Apple, and Compaq. As the names apply PCs are used and operated by end users for their own particular processing needs such as payroll, inventory control, asset management, result verification, patient medical records, and other general accounting routines. Laptops and palmtops in particular are the portable types of PCs built with a lot of mobility functionality. Not so much skill is required to operate micro computers as compared with mini and mainframe computers.

**Workstation**

A workstation is so much like a PC except that it is more powerful and has more capabilities for handling mathematical and graphics-processing than a PC. It can handle more complicated tasks than PC in the same amount of time. Workstations are used mainly in handling computing (number crunching and algorithmic) applications such as in science, engineering, and design work that requires powerful graphics or computational capabilities rather than data processing applications where arithmetic operation may be ideal.

**Supercomputer**

A supercomputer is highly sophisticated and powerful machine that is used for tasks requiring rapid and complex calculations with hundreds of thousands of variable factors. Supercomputers traditionally have been used in scientific and military work, but they are starting to be use in business as well. A supercomputer is especially sophisticated and powerful type of computer that is used primarily for extremely rapid and complex computations with hundreds of thousands of variable factors. Supercomputers traditionally have been used for classified weapons research, weather forecasting, and petroleum and engineering applications, all of which use complex mathematical models and simulation. Although extremely expensive, supercomputers are beginning to be employed in business for data mining and the manipulation of vast quantities of data.

Supercomputers can perform complex and massive computations almost instantaneously because they can perform hundreds of billions of calculations per second-many times faster than the largest mainframes. With advances in communications technologies any these categories of computers could be linked in a network enabling users to share files, software, peripheral devices, such as high speed printers, large external storages or other network resources. Special Server computers designed to support network, providing large memory and disk-storage capacity, high communications capabilities, and powerful CPUs. As technology continues advance, we expect that these distinctions will become less pronounced.

## 3.5 The Basic Operations of Computing

The computer processes data by performing the following five main operations

1) Input
2) processing
3) Output
4) Storage
5) Communication

**Input Operations:**

At this stage, data or instructions are captured electronically or entered by means of the available input device. An input device is hardware such as a keyboard that allows data from the external environment to be entered into the computer for processing. The data after it has been captured is transform into a form in which the computer can process it.

**Processing Operations**:
At this stage, the already captured and transformed data is manipulated to generate desired result for the end user other processing systems. The data is worked on by the instructions in the form of programs or queries provided by the users. The instruction and the data determine what output is received from to the computer. The processing instructions may be to add, subtract, multiply, find total, summarize, group, select some data based on some condition etc.

**Output Operations**:
At the stage the result or information obtained from the data is produced in a form acceptable by the user. An example of on output will be a list of all registered students in the department of accounting who are in their second year at National Open University, Lagos Centre. The output can be printed as printed text, played as sound, displayed as charts or graphs on the computer screen. Output is usually governed by the need to communicate specific information to a specific audience. The only limit to the different forms of output you can produce is the different types of output devices currently available.

**Secondary-storage operations:**
At this stage of operations, data, information, and the instructions used for the processing of data are stored temporarily or permanently in primary or secondary storage devices. Data and instruction are stored in primary storage devices during processing to allow easy access and fast processing. Secondary storage devices are used for to store data or instructions more permanently. An example of a primary or internal storage device is RAM (Read Only Memory). While example of a secondary or external storage device is a flash disk.

**Communication Operation**:
There may be a need to transmit already processed data to and end user or a output device in a remote location. Similarly, data may be gathered from a remote location. The communication operation of the computers performs these by using the communication hardware. This facilitates the connection betweencomputer and between groups of connected computers called network. Computers linked together can share hardware, programs and data. Though, computers can operate as standard alone machines i.e. they may not be connected to anything else. By connecting them in a network more benefits are realized.
The five basic operations of a computer systemtake place so fast that they seem to happen all at the same time.

### 3.6 Benefits o f Using Computer in Business

- It leads to improved customer relations due to its reliability, generation of more timely reports, and speedier responses to enquiries regarding business operations
- Increases the productivity of staff in general be helping to handle boring and routine operations leaving the staff to be engaged in decision making
- Improved cash flows due to improved sales accounting systems particularly those relating to credit control, invoicing and statement preparation
- It guarantees an improved access to inform by means of online and real-time access to information system
- Allows for greater degree of systems integration on the basis that the output of one part of the system (sub system) provides the input to a related sub system, which has the effect of eliminating duplication and delay
- Makes the presentation of information for decision making easy to comprehend. Information is presented in simplified formats such as graphs, charts, graphics images etc
- Helps in the simplification of problem solving by the use of problem solving software
- Makes the supply of information for improving managerial decision readily available

## 4.0 Conclusion

The terms data and information are commonly used by many people as if they mean the same thing. The differences between them have been made clearer. Data processing is not exactly the same as computing. Some basic operations that are involved in data processing include: Data Collection, Data Capture, Data Recording, Data Entry,
Data Transmission, Data Sorting. Electronic data processing requires the use of computers which ma y be distinguished by their sizes, types or generation

## 5.0 Summary

In this unit, we have explained the basic Electronic Data Processing Concepts. This should provide a good background for the easy comprehension of the contents in other units.

## 6.0 Tutor Marked Assignment

Q1 Explain the term Data Processing
Q2. What is an Electronic Data Processing System?
Q3. Describe the different sizes of computer systems
Q4. What are the main operations of computer systems?

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3. 1948, Cybernetics: Or the Control and Communication in the Animal and the Machine. Paris, France: Librairie Hermann & Cie, and Cambridge, MA: MIT Press. Cambridge, MA: MIT Press.
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**UNIT 3: BASIC HARDWARE COMPONENTS AND MEMORY CAPACITY MEASUREMENT CONTENTS**



## 1.0 Introduction

To function properly, the computer needs both hardware and software. Thus a computer system is made up of hardware and software. The hardware consists of the electronic and electromechanical parts of the computer. This is the tangible or touchable part of the computer. These components include: input devices, central processing unit, main memory, secondary memory, and output devices. Two components handle processing in a computer: the central processing unit, or CPU, and the memory. Both are located on the computer system board, or motherboard, the circuit that connects the CPU to all other hardware devices. The processor works hand in hand with other circuits known as main memory and registers to carry out processing. The basic unit of information representation in the computer is he bit.

## 2.0 Objectives

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

- Identify and describe the basic hardware components of a computer system
- Explain the units of measuring computer memory

## 3.1 Input Device

An input device is used to communicate data and instructions or programs to the computer. The input device accepts the data and coverts them into machine understandable forms that can be processed by the computer.

## 3.2 The Central Processing Unit (CPU)

The CPU is the brain of the computer and it is the place where data is manipulated within the computer system. In a microcomputer, the entire CPU is contained on a tiny chip called a microprocessor which is usually mounted on a piece of plastic with metal wires attached to it. The processor consists of two functional units: the control unit and the arithmetic-logic unit.

## 3.3 The Control Unit

All the computer s resources are managed from control unit. The control unit of the processor coordinates all activities of the computer system. It directs the movement of electronic signals between arithmetic-logic

units and main memory and also directs the electronic signals between main memory and the input and output devices.

### 3.4 Arithmetic and Logic Unit

The computer can perform only two types of operations: arithmetic operations and logical operations. The arithmetic-logic unit is the electronic circuitry capable of performing these two basic logical operations. Arithmetic operations include addition, subtraction, multiplication, division and exponentiation. All data input into the computer system must first be converted into numbers (0 and 1) before they are processed. In addition to arithmetic operations the computer is able to perform logical operations on two or more numbers. Logical operations are comparisons operations. The ALU compares two pieces of data to see whether one is less than <, equal to =, greater than (>), the other. Other comparison operations are greater than or equal to (>=), less than or equal to (< =) or not equal to ()

### 3.5 Memory

The CPU main job is to follow instructions encoded in programs but it does not have the capability to store entire programs or large sets of data permanently. However, the CPU has registers which are devices capable of holding a few bytes of data or instructions at a time. CPU needs to have millions of bytes of space where it can hold programs and the data being manipulated while they are being used. This area is called memory. Computers use two types memory primary and secondary memory. A computer s primary memory is an electronic device that store information necessary for a program to run. This consists of the volatile memory (RAM) and the non volatile memory (ROM).

**Random Access Memory (RAM)**

RAM is an acronym for Random Access Memory. It is used for short-term storage of data or program instructions. RAM is volatile: Its contents will be lost when the computer s electric supply is disrupted by a power outage or when the computer is turned off. The purpose of RAM is to hold programs and data while they are in use. Physically,
RAM consists of some chips on a small circuit board. A computer does not have to search it entire memory each time it needs to find data. Access to the data is usually direct using it memory address. The main functions of the RAM chip include:

- It holds data for processing
- It holds instructions (the programs) for processing
- It holds data that has been processed (useful information) and is waiting to be sent to an output device.

**Read Only Memory (ROM)**

This is a nonvolatile type of memory. Nonvolatile chips always hold the same data and cannot be changed. One what to do when the power is first turned on. Among other things, ROM contains a set of start-up instructions, which ensure that the rest of memory is functioning properly, check for hardware devices, and check for an operating system on the computer disks drives. Unlike the RAM, which is constantly being written on an erased, ROM cannot be written on or erased by the computer user. In addition ROM chips remember, permanently, information supplied by the manufactures such as the information about the manufacturer.
Three variations of ROM chips are used in special situation PROM, EPROM and EEPROM.

**Programmable Read Only Memory** (PROM)

This is an acronym for programmable read-only memory. These are blank chips on which the buyer, using special equipment, writes the programs. Once the program is written, it cannot be erased. Some microprocessor software packages come on PROM units. PROM chips are used by manufactures as control

devices in their products.

**Electronically Erasable Read-Only Memory** (EPROM)
EPROM stands for electronically erasable read-only memory. They are like PROM chips except that the contents can be erased, using special equipment and new materials can be written. EPROM chips are used for intelligent device control, such as in robots, where the program may have to be modified on regular basis. Programs in EPROM chip can be erased and reprogrammed. The advantage of EEPROM chips is that they need not be removed from the computer to be changed.

Registers
These are special, high-speed storage area within the CPU. All data must be represented in a register before it can be processed. For example, the control unit might load two numbers from memory into the registers in the ALU. Then it might tell the ALU to multiply the two numbers (arithmetic operations), or to see whether the number are equal (a logical operation). The number of registers that a CPU has and the size of each help determine the power and speed of a CPU. For example a 64-bit CPU is one in which each register is 64 bits wide. Therefore, each CPU instruction can manipulate 64 bits of data.

### 3.6 Measuring the Memory Capacity of Computer System

**Bits:**
The term bit is a short form of binary digit. A bit is the smallest possible unit of data. To represent anything meaningful the computer needs groups of bits.

**Bytes**:
A group of eight bits is called a byte. It is the next larger unit of data within a computer system. With one byte, the computer can represent up to 256 different values because it is possible to count from 0 to 255 with 8 binary digits. The byte is important unit because it can be adequately used to represent any character keyboard, including all the letters (uppercase and lowercase), number, punctuation marks, and other symbols.

representation
an
on the

**Kilobyte**:
A kilobyte, abbreviated K or KB represents approximately 1000 bytes (or characters). The actual value of I Kilobyte is 1024 (2 10) bytes

**Megabyte:**
A megabyte, abbreviated M or MB and sometimes called meg is used to refer to about **1** million bytes of data.

**Gigabytes:**
A gigabyte, G or GB, often pronounced gig-a-bite, is used to refer to about 1 billion bytes of data.

**Terabyte**:
A terabyte, T or TB, is used to refer to about 1 trillion bytes, or 1000 gigabytes of data.

**Petabyte**:
This is a new measurement which accommodates the huge storage capacities of modern database- It is used to refer to about 1 million gigabyte data.

## 4.0 Conclusion

Computers require the hardware components and software to process data. Computer hardware consists of input devices, central processing units, memory and output devices. A bit is the smallest possible unit of data. Larger amount of data are measured in bytes, kilobyte, megabyte etc.

## 5.0 Summary

This unit has provided you with adequate information on the different hardware components. The units of measuring the memory capacity of computers are also covered.

## 6.0 Tutor Marked Assignment

Q1 What are the main functions of the RAM chip?
Q2. Explain the meaning of the term RAM is volatile
Q3. Describe three variations of ROM
Q4. Explain the functions of a register

## 7.0 References/Further Readings

Brain K. Williams, and Stacey C. Sawyer, Using Information Technology, A practical Introduction to Computers and Communications, McGraw Hill, 2005, N.Y

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## UNIT 4: BASIC SOFTWARE FOR DATA PROCESSING

## CONTENTS



### 1.0 Introduction

Apart from the hardware of a computer discussed in Unit 2, a computer system requires software to make the best use of it capability in solving problems. Computers do not have intelligence of their own; they rely on the instructions and data supplied by a user in order to perform a task. These instructions are called software. Software consists of a group of related programs written in a specific code called programming language. Software can be purchased as Commercial, off-the-shelf (COTS) or developed in house for data processing purposes. Software purchased to perform a general business functions is often referred to as a software package.

### 2.0 Objectives

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

- Explain the term software
- Describe some basic software for data processing

### 3.0 Software systems

Software consists of a group of related programs written in a specific code called programming language. Software is created by professional software programmer and comes on disk, CD-ROM, or downloadable online across the Internet. Software can generally be divided into two categories.

- System software
- Application Software

#### 3.1.1 Systems Software

This is software designed to allow the computer to manage its own resources and run the hardware and basic operations. The may be complex to develop and are provided by the manufacturers of computer systems to complement computer hardware. However, others may be purchased from vendors. This software runs the basic operations; it lets the CPU communicate with the keyboard, the screen, the printer, and the disk drive. However, it does not solve specific problems relating to a business or a profession as applications software. Some examples of system software are operating systems and Language translators.

**a.** Operating System

An operating system is the most important software for a computer. It is made up of many component programs and manages the overall operations of a computer system. Some of the tasks performed by the operating system are:

- It controls various input and output devices and coordinates input and output operations
- It Manages the systems resources such as available memory space in the primary and secondary storage devices
- It allocate memory and processor time to programs
- It validates users and ensure that the resources a user is requesting is made available

Some popular operating systems are Windows, Operating System 2, Macintosh Operating System, Novell Netware, UNIX, and Linux.

**b. Language Translator**

This is software which translates a computer program written in a high-level programming language, or assembly language to a machine understandable form. If you write a program say in BASIC language, it cannot be executed directly without a translator. A program that is written in high level language is a source program. A source program in its translated form made up of machine codes is called object program. High-level languages are either translated from source code to object code by an interpreter or a compiler. An interpreter translate one line of a high-level instruction and immediate execute the code, proceeding to the next until the entire program is executed. A compile on the other hand, scans the entire program first and then translate it into machine (object) code.

**c. Utilities**

These are programs which are often required by man y application programs. Examples include programs for formatting or defragmenting a disk. Also we have the sort/merge utilities which are used for sorting and merging large volumes of data.

### 3.1.2 Application Software

Application software includes programs that are developed using systems software in order to achieve some tasks. There are two types of applications software: application programs that you purchase for solving special classes of problems and application programs that you write to solve your own problems. Some commercially available end- user programs (application software) which are developed by professional programmer teams can be used with little or no additional programming skills. Examples of application software include word processing and desktop publishing software; spreadsheet; database programs; graphics programs; communication software; and special-purpose programs suitable for accounting, scientific and engineering application, education, and entertainment and so on.

## 3.2 Software for Data Processing

The computers in a data processing environment would run one or more of the following software to facilitate data processing activities.

**a.** Word processing software

This allows you to use computers to create, edit, sore and print documents. You can easily insert, delete, move word, sentences, and paragraphs without ever using the eraser. Of all computer applications, word processors are the most common. Word processing also offers a number of features for dressing up documents with variable margins, type sizes, and style. The user can do all these manipulations on a document or report on the screen before printing it. For example, if you make a typing mistake, you simply move the cursor to the position and correct the mistake. You can move a section of your document to another easily and apply different kind of formatting on your document. Word processing software also features for spelling and grammar, Insert, delete, copy, pastes, find, replace, search, cut, copy, format, and

printing. Some commonly used word processors are Microsoft Word, WordPerfect, AmiPro, etc

**b. Spreadsheet Software**

Traditionally, spreadsheet was simply grid of rows and columns on special paper that was used by accountant and others to produce financial projections and report. Electronic spreadsheets application allows users to enter data in rows and column, calculate means perform statistical analyses, create tables and produce other financial schedules. Spreadsheet software also has features that allow the creation of analytical graphics. When viewed on a monitor or printed out, analytical graphics, or business graphics, help make data and the generated report easily to comprehend and analyzed for decision making by management. Electronic spreadsheets have features that allow charts and graphs to be created from a table of numbers to show the significance of a selection of data which can be displayed in a number of ways: bar graphs, line graphs, and pie charts etc. A spreadsheet document is called a worksheet. Some commonly used Spreadsheet software are VisiCalc, Lotus 1-2-3, and Microsoft Excel etc.

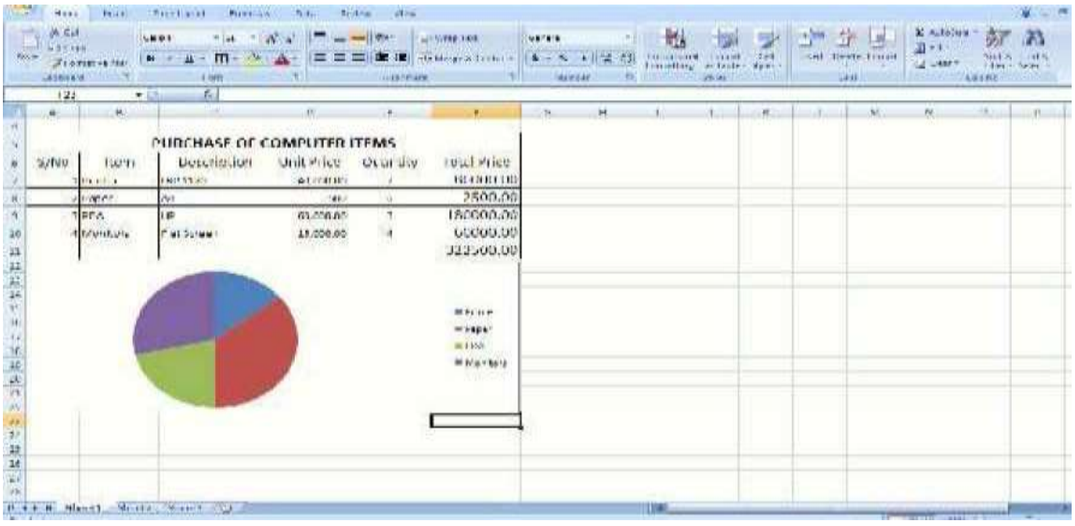

Figure 1: Microsoft Excel Chart

**c. Database Software**

A database management system (DBMS) is a collection of programs that allows you to store modify and extract information from a database. A database is a collection of interrelated files in a computer system. With a DBMS, activities such as updating, deleting, adding, and amending of records are easily performed. Databases can also be seen as electronic filing cabinets that allow systematic storage of data for easy access, reporting, and retrieval of records. Some commonly used database software are MS Access, Informix, Sybase, Oracle, DB3

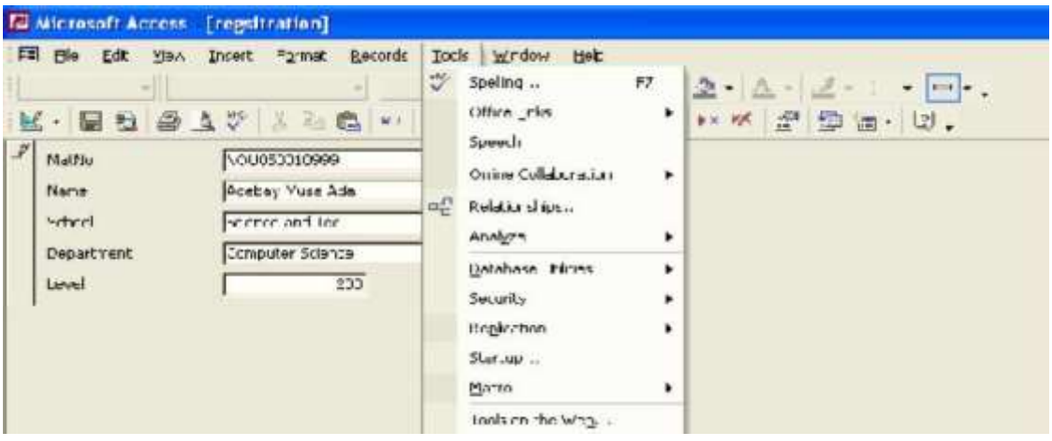


Figure 2: Microsoft Access Database

**d. Presentation graphics**

Presentation graphics enable users to create highly stylized graphics for slide show and report. Presentations software ma y make use of some analytical graphics (bar, line, pie chart) and also allow you to use electronic painting and drawing tools for creating lines, rectangles and others forms of shape. Most presentation software have features that allows you to add text, animated sequences, and sound to your report. Your report or presentation can be sent to the screen or printed on transparency acetates. Some presentation software packages provide artwork called clip art that can be electronically cut and pasted into the graphics. Some commonly used presentation graphics are Examples of well known presentation packages are Microsoft PowerPoint, Aldus Persuasion, Lotus Freelance Graphics, and SPC Harvard Graphics

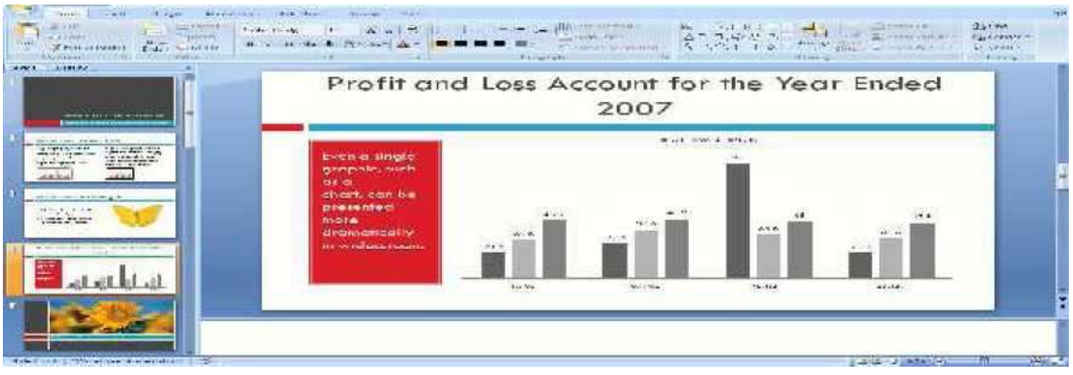


Figure 3: Microsoft Power Point Presentation

## 4.0 Conclusion

The data processing requirements of an organization is a major factor in determining which software to acquire or use. Software development could be one of the functions of a data processing department.

## 5.0 Summary

In a data processing center, different computer hardware and software are usually required for the manipulation of data. Some of the commonly used software are: word processor, database, presentation graphic, spreadsheets, operating system etc

## 6.0 Tutor Marked Assignment

Q1. State four main tasks of operating systems
Q2. State some advantages of in-house developed software over COTS

## 7.0 References/Further Readings

George Beekman, Eugene J. Rathswohl, Computer Confluence, Exploring Tomorrow s Technology, IT Edition, Prentice Hall, New Jersey, 2003

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Alexis Leon and Matthew Leon, Fundamental of Information Technology, L & L Consultancy Services Pvt. Ltd, 1999

**MODULE 2;**

**Unit 5: Data Capturing and Reporting Devices**

**Unit 6: Data Storage Devices**

**Unit 7: File Organization**

**Unit 8: Data Processing Technique**

**Unit 9: Traditional File System Processing**

## UNIT 5: DATA CAPTURING AND REPORTING DEVICES

**CONTENTS**



### 1.0 Introduction

Computers interact with its external environment and users via the Input / Output devices.
Inputs are the signals or data sent to the system, and outputs are the signals or results received from the system to the outside. Input devices are hardware equipment by which a computer system receives data while output devices are hardware equipment by which results are communicated to the outside world.

### 2.0 Objectives

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

- Identify and describe data capturing devices
- Identify and describe data reporting/output device

### 3.1 Input Devices

For data to be processed, they are first to be captured via input devices and translated to computer understandable form. Input devices are use to capture and translate data into a form the computer can process. Though the data may be captured in the forms of text, characters, letters, images, sound, pictures and video, the translated data will be in the form of 0s and 1 s, or off and on signals which can be easily processed by the computer. Input devices exist in the following categories:

#### 3.1.1 Keyboard

Keyboard is used for entering text and numeric values into the computer. It is the most popular means of data entry in microcomputers. The keyboard may look like a typewriter but with some special keys added. The keyboard has facilities for converting letters, numbers and other characters into electrical signals that are machine-readable the processor of computers. Data entry functionality is also available

on via keys on a bank s automatic teller machine or the keypad of a personal digital assistant or a cell phone.

### 3.1.2 Pointing Devices

These constitute the second category of input hardware. These devices control the position of the cursor or pointer on the screen. Pointing devices include:

#### a. Mouse

A mouse is an input device that is popularly used with microcomputers. When used with desktop computers it is rolled about on a desktop to direct a pointer and select commands on a computer display screen. The point-and-click actions of the computer mouse is fast making it an alternative to keyboard and text-based commands since most of the commands executed with a keyboard can almost be done with a mouse. In addition, the mouse can be used to draw images on the screen.

#### b. Trackball

This is a variant of the mouse. It can be moved on top a stationary device that is rotated with the fingers or palm of the hand. Trackball are commonly used with hand held devices.

#### c. Touchpad

Touch pads allow a user to control the cursor/point on the computer display screen with his fingers. It is about the same size as a mouse, but is usually, rectangular and flat devices that are uses very weak electrical field to be activated.

#### d. Joysticks

A joystick is a pointing device that consists of a vertical handle like a gearshift lever mounted on a base with one or two buttons. Joysticks are used principally in video games, in some computer-aided design systems, and in computerized robot systems.

### 3.1.3 Pen-Based Devices

Pen-based computer devices use a pen-like stylus to capture a user s handwriting and marks into a computer. This is one of the means by which data is entered into small handheld computers such as personal digital assistants (PDAs).

a. **Light Pen**

This is a light-sensitive stylus, pen-like device that can be connected by a wire to the computer system. A stylus is a pen-like device with which a user sketches an image.
When used to capture data, the user brings the pen to desired point on the display screen and presses the pen button, which identifies that screen location to the computer.

b. **Digitizing Tablets**

A digitizing tablet consists of a tablet linked by a wire to a stylus or puck. A puck is a copying device with which the user copies, or traces, an image. Digitizing tablets are used to capture data directly into the computer for processing.

### 3.1.4 Source-Data Entry

Keyboard entry requires typing; errors could be introduced by the operator during data entry. Non-keyboard source-data entry devices such as scanner are used to minimize data entry errors. The following categories of devices are used:

a. **Scanning Devices**

Scanners use laser beams and reflected light to capture and translate hardcopy images of text, drawings, photos, and the like into computer understandable form for processing. Scanning devices include Mark and character recognition devices, Fax machines and Imaging systems. Specifically, the Mark and character recognition devices are usually referred to by their abbreviation OCR, OMR and MICR,

b. **Optical mark recognition**

Optical mark recognition (OMR) uses a device that reads pencil marks and converts them into computer-understandable form. This technology is widely accepted by many examination bodies such Joint Admission an Matriculation Board (JAMB), West African Examination Council (WAEC), NECO (National Examination Council Organization) and other Scholastic Examination bodies across the world as a convenient way of processing their candidates results.

c. **Optical Character Recognition**

Optical character recognition (OCR) devices are used to translate designed marks character, and code into digital form for processing by the system. The most widely used optical code is the bar code, which is used in point-of-sale systems in supermarket, shopping mall, hospital, libraries, military operations, utility bills and price tags on departmental-stores merchandized and transportation facilities. The code can include time, date, location, and identification data for deriving appropriate information for decision making. It is usually more convenient and faster to use OCR than retyping a document into the computer.

d. **Magnetic ink Character Recognition (MICR)**

This Technology is used in cheques processing by most banks and other financial institutions. An MICR device has facilities to interpret and translates magnetic ink character on Bank cheque which contains characters identifying the bank, cheques number etc into computer understandable form.

e. **Fax Machine**

A fax machine also referred to as facsimile transmission machine has facilities that scan an image on paper into electrical signal, transmit same over telephone lines and re-creates the image to a receiving fax machine on paper.

### 3.2 Other input devices

Sensors are devices that collect data directly from the environment for input into a computer system. For instance, atmospheric data can captured and transmitted via sensor network to a data processing centre for weather forecasting.

**Voice input**

These devices convert spoken words into computer understandable digital form for processing. When voice recognition systems are used to capture data for processing, the user documents can be created by speaking words into a computer rather than keying them in. The system will have audio facilities such as sound card, microphone, and speakers.

The physical component or materials which data is stored are called storage media. The hardware components that write data to, and read it from, storage media are called storage devices. For example, a diskette is storage medium, whereas a diskette drive is a storage device. Storage media and derives have evolved dramatically since computers were in their infancy, and this pace has accelerated since the introduction and growing popularity of PCs.

### 3.3 Output Devices

Outputs are the outcome of processed data. An output device is any piece of computer hardware equipment used to communicate the results of data processing carried out by a computer to the outside world. Some common output devices include: Visual display unit A visual display unit (also called VDU, monitor, or screen), Printers and Plotters.

**a. Monitors**

The first is the typical monitor that looks like the television screen and used uses a large vacuum tube, called a cathode ray tube (CRT). It operation is very similar to that of television picture tube, with an electronic gun shooting a beam of electrons to illuminate the pixels (picture elements) on the screen. The resolution is determined by the number of pixel per screen. The resolution of a monitor indicates how densely the pixels are packed.

The second type, know as flat-panel display, is used with laptops or notebook computers. While the earlier monitors could only display one color i.e. black, grayscale, etc modern monitors have good support for color and graphics display though this may require more memory.

**b. Printers**

Printer is a device that prints text or illustration on paper and in many cases on transparencies and other media. They are the most popular output devices beside monitors. The speed of early printers was measured in units of characters per second while that of modern printers are measured in pages per minute. There are different types of printers based on the technology they use. We shall only describe a few that you will find in a data processing center:

**i.** Dot-Matrix Printer

This operates by striking pins against an ink ribbon to create the required characters. Each pin makes a dot, and combination of dots form characters and illustrations. Dot matrix printers are cheap, relatively fast but they do not produce high-quality output.

**ii.** Line Printer

This type of printer is able to print an entire line at one time with as much speed as 3,000 lines per minute. The print quality is relatively low and they are very noisy.

**iii.** Thermal Printers

This type of printer produce images by pushing electrically heated pins against special heat-sensitive paper. Thermal printers are economical and are used in most calculators and many fax machines. They produce low-quality print and paper requires special handling of papers.

**iv.** Ink-jet Printer

This work by spraying ionized ink at a sheet of paper. Magnetized plates in the ink s path direct the ink onto the paper in the desired shapes. They are popular with as portable printers because they could exist in small sizes. Ink-jet printers require a special type of ink that may smudge on low-cost copier paper. They provide an economical way of way to print full-colour documents.

**v.** Laser Printers

Laser printer utilizes a laser beam to produce an image on a drum. The light of the laser alters the electrical signal on the drum wherever it makes a hit. The drum is made to roll through a reservoir of toner, which is picked up by the charged portion of the drum. After which, the toner is transferred to the paper through a combination of heat and pressure.

LaserJet printer produces very high quality output. This is as a result of the resolution that is, how many dots per inch (dpi) they lay down. The available resolutions range from 300 dpi at the low end to 1,200 dpi at the high end. The color laser printers are able to produce colored outputs though they are usually more expensive because of the addition toners required. Laser printers are non-impact printers; they are not as noisy as dot-matrix or line printers. They are relatively fast, although not as fast as some dot-matrix printers. Their speed ranges from 4 to 20 pages of text.

**c.** Plotter

A Plotter, though mainly used for engineering applications uses pen to draw picture or lines on paper based on commands from a computer. The can produce continuous lines, whereas printers can only simulate lines by printing a closely spaced series of dots. Plotters are not as fast as printer but are useful in producing large-size chart, maps, or drawings even in color.

**d.** Speaker

A voice output device such as a speaker converts digital output data back into intelligible speech. They

are use to deliver audio output from animation, multimedia application from the web and music to the user.

**e.** Microfilms and Microfiche

Microfilm and microfiche were used to store large quantities of output as microscopic filmed document, but they are now being replaced by optical disk technology.

## **4.0** Conclusion

Input/output refers to the communication between a data processing system such as a computer, and the outside world. Users interact majorly with computer systems through input and output devices.

## **5.0** Summary

This unit covers a wide range of devices that can be used for capturing data. The choice of input device will depend on the type source. For example, in capturing bank transaction data from a cheque a MICR device will be most suitable. Also we covered various output devices such as printers, plotters, and speakers.

## **6.0** Tutor Marked Assignments

Q1. List the input and output devices you would expect to see in an examination processing IT centre?

Q2. List 3 input devices and 2 output devices that will needed for data processing in a large Supermarket

## **7.0** References/Further Readings

Alexis Leon and Matthew Leon, Fundamental of Information Technology, L & L Consultancy Services Pvt. Ltd, 1999

**UNIT 6: DATA STORAGE DEVICES**

**CONTENTS**



## 1.0 Introduction

The computer primary memory is limited in the amount of information it can store at a time. In addition, the content of the RAM is temporary i.e., once the power of the computer is turned off, all the data and program within it simply vanishes. This is why data must be stored on secondary storage devices which are able to hold data and programs on a more permanent basis. External storage devices consist of large-capacity, slow-access data storage attached to a digital computer and used to store information that exceeds the capacity of main storage. Two main technologies are used to store data today: magnetic and optical storage. Although devices that store data typically employ one or the other, some combine both technologies. The primary types of magnetic storage are:

## 2.0 Objectives

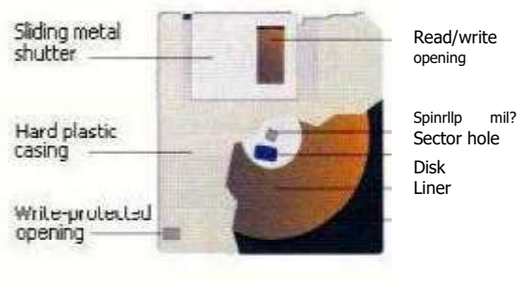
At the end of this unit, you should be able to:

- Identify and describe data storage devices
- Parameters for disk performance

## 3.1 Diskette

A diskette or floppy disk is a data storage medium that is composed of a disk of thin, flexible magnetic storage medium encased in a square or rectangular piece of Mylar plastic. Floppy disks are read and written by a floppy disk drive or FDD, the initials of which should not be confused with "fixed disk drive", which is another term for a hard disk drive. Floppy disk exist in the following sizes; 8-inch (200 mm), 5^-inch (133 mm), and the most common 3^-inch (90 mm). Though floppy disks are still used in some data processing environment, they are now being largely superseded by flash and optical storage devices while some users consider emails as a convenient way of exchanging small to medium size digital files. Floptical drives combine magnetic and optical technologies to store about 21MB of data on a media similar to 3^-inch floppy

Figure 1: Floppy Disk



Disks. The name is a portmanteau of the words 'floppy' and 'optical'. This device was introduced in 1989 by In site Peripherals of San Jose, but did not become popular, because it of the limited storage capacity it offer. A similar technology was used in the Laser Servo-120 drive introduced in 1996 with 120MB capacity.

### **3.2** Hard disks

In a data processing environment, a hard disk drive (HDD), commonly referred to as a hard drive, hard disk or fixed disk drive, serve as permanent storage device for large amount of data. Originally, the term "hard" was temporary slang, substituting "hard" for "rigid", before these drives had an established and universally-agreed-upon name. The hard disk drive (often shortened to "hard drive") and the hard disk are not the same thing, they are packaged as a unit and so either term is sometimes used to refer to the whole unit.

A hard disk is really a set of stacked "disks," each of which, like phonograph records, has data recorded electromagnetically in concentric circles or "tracks" on the disk. A "head" (something like a phonograph arm but in a relatively fixed position) records (writes) or reads the information on the tracks. Two heads, one on each side of a disk, read or write the data as the disk spins. Each read or write operation requires that data be located, which is an operation called a "seek." (Data already in a disk cache, however, will be located more quickly.) Modern computers come with a hard disk that contains several billion bytes (gigabytes) of storage.

Figure 2: Hard Disk

### **3.3** Removable hard disks

This is a variation of the hard disk in which hard disks enclosed in plastic or metal cartridges are easily removable like floppy disks. It combines the best features of hard and floppy disks. They are used to provide large economical, high, fast, and portable storage facility for data processing.

### **3.4 Magnetic tape**

Magnetic tape has historically been found more convenient means of large data storage over disk where media portability or removability is required for backup. Magnetic Tape uses the same read/write techniques as disks. Data is stored on flexible Mylar tape covered with magnetic oxide. Data is stored in

Figure 3: Tape

parallel tracks of 9, 18 or 36. Data on tapes are accessed sequentially. Tapes provide slow, very cheap, large capacity backup for data. The rapid advances in disk storage technologies resulting in and the improvement in disk storage density, and reduced price, coupled with arguably declining innovation in tape storage technology, has reduced the market share of tape storage devices.

### **3.5** Optical Storage

The optical storage devices such as CDs and DVDs are means in which data is written and read with a laser for archival or backup purposes. The optical storage devices are fast replacing both hard drives in computers and tape backup in mass storage. This is because optical media are more durable than tape and less vulnerable to environmental conditions lasting up to seven times as long as traditional storage media. However, at present optical media are slower than typical hard drive speeds, and offer lower storage capacities.

Optical disk capacity ranges up to 6 gigabytes i.e. 6,000,000 bytes which is far more compared to the 1.44 megabytes (MB) i.e., 1,440,000 bytes offered by a floppy disk. A newer technology, the digital versatile disc DVD, has about 4.7 gigabyte storage capacity on a single-sided, one-layered disk compared with 65 gigabyte of storage for a CD-ROM disk. Invariably, they can be used to hold large amount of data.


Figure 4: Optical Storage

A USB flash drive is a NAND-type flash memory data storage device integrated with a USB (universal serial bus) connector. USB flash drives are typically removable and rewritable, much shorter than a floppy disk (1-4 inches or 25-102 mm), and weigh less than 56g. Their storage capacities typically range from 64MB to 32GB or more. They have 10-year data retention. USB flash drives offer potential advantages over other portable storage devices, particularly the floppy disk. They are more compact, faster, hold more data, are more reliable for lack of moving parts, and have a more durable design.

Figure 5: A Flash

### **3.6** Accessing Data from Disk

Bits of data (0s and 1s) are stored on circular magnetic platters called disks. A disk rotates rapidly (& never stops).A disk head reads and writes bits of data as they pass under the head. Often, several platters are organized into a disk pack (or disk drive). Disk contains concentric tracks. Tracks are divided into sectors. A sector is the smallest addressable unit in a disk.

**Figure 6: Disk Organization**

When a program reads a byte from the disk, the operating system locates the surface, track and sector containing that byte, and reads the entire sector into a special area in main memory called buffer. The bottleneck of a disk access is moving the read/write arm. So it makes sense to store a file in tracks that are below/above each other in different surfaces, rather than in several tracks in the same surface.

A cylinder is the set of tracks at a given radius of a disk pack. i.e. a cylinder is the set of tracks that can be accessed without moving the disk arm. All the information on a cylinder can be accessed without moving the read/write arm.

### 3.7 Disk Performance

In measuring the performance of a storage device, we ma y consider the following three parameters.

**a.** Rotational delay/Latency

This is the time it takes to position the proper sector under the read/write head. In general, it is used to refer to the period of time that one component in a system is spinning its wheels waiting for another component. Latency, therefore, is wasted time. It makes sense to separate read latency and write latency, and in case of sequential access storage, minimum, maximum and average latency. Consider a hard disk which rotates at about 5000 rpm i.e. one revolution per 12 msec.

The average latency can be calculated as follows:
Min latency = 0
Max latency = Time for one disk revolution Average latency (r) = (min + max) / 2 = max / 2= time for V disk revolution typically 68 ms average

**b.** Throughput

This is the rate at which information can be read from or written to the storage. It is expressed in terms of megabytes per second or MB/s. A media accessed sequentially, as opposed to randomly, typically yield maximum throughput.

**c.** Seek time

This is the amount of time between when the CPU requests a file and when the first byte of the file is sent to the CPU. Seek times between 10 and 20 milliseconds are common.

**4.0** Conclusion

Computer data storage, often called storage or memory, refers to computer components, devices, and recording media that retain digital data used for data processing. Secondary storage differs from primary storage in that it is not directly accessible by the Central processing unit. Secondary storage does not lose the data when power suddenly goes down i.e. it is non-volatile. Secondary storage is not as expensive as primary storage consequently, a higher magnitude of data are stored in secondary storage than primary storage in data processing centers.

**5.0** Summary

This unit covered computer data storage devices and their performance measurement.
The knowledge acquired will be useful in the following units.

**6.0** Tutor Marked Assignment

Q1. When do you require a Secondary storage?
Q2. Explain the meaning of the term Latency

**7.0** References/Further Readings

Alexis Leon and Matthew Leon, Fundamental of Information Technology, L & L Consultancy

Services Pvt. Ltd, 1999

http://computer.howstuffworks.com/hard-disk7.htm

## UNIT 7: FILE ORGANIZATION



### 1.0 Introduction

It is not enough to acquire excellent computer system; hardware and software. Files within the system must be well maintained, managed and organized Good file organization leads to productivity. When files are well arranged and maintained, users can easily access and retrieve the information they need in good time. Different ways of file organization are: Serial File Organization, Serial File Organization, Sequential File Organization, Indexed Sequential Organization, Direct or Random File Organization.

### 2.0 Objectives

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

- Explain the meaning of a computer file
- Identify and describe file organization techniques
- Describe the type of data files used in a Data processing Environment

### 3.0 Main Content

#### 3.1 What is a Computer file?

A file is collection of data or information that has a name called the filename. Most of the information stored in a computer system is stored as files. A file is often stored with a user s given name and a system supplied extension. The name of the file should reflect the content of the data stored in the file. For example, payroll or result File. The extension of the file should reflect either the type of file (i.e. program file, image file, audio file etc) or the software used to create the file (e.g MS WORD document, MS EXCEL Worksheet, BASIC Compiler). For example;

| S/No | Type of File/Software | Extension |
|---|---|---|
| 1 | Micro Soft Word Document | ,doc |
| 2 | Audio File/Vidio.wav, axi | $MP^3$ |
| 3 | Basic Compiler | .bas |
| 4 | Text | .$t_x$t |
| 5 | Microsoft excel | .xls |
| 6 | Image | $P^n$g,jp.gt |

**Table 1 Computer files.**

The different types of file stored in a computer system are as follow:

**a. Program File**
These are files that store sets of instructions written in a programming language. A source program file for examples contains the instructions written in a high level language such as BASIC or FORTRAN programming language by a programmer while the object file is the translated form of the source file in machine code after. The files that contain the machine code are called executable files (or binary files)

**b. ASCII File**
ASCII stands for American Standard Code for Information Interchange. ASCII files are text-based files. That is the characters are represented in ASCII code (without formatting such as underline, italics, boldface or graphics). Files stored in this format are used to to transfer documents between incompatible computer platforms, such as IBM and Macintosh.

**c. Image File**
Documents containing digitized graphics or images are stored in this format.
Image files: Image files contain digitized graphics
Audio and video files: Audio files contain digitized sound while video files contain digitized video images and animation.

**d. Audio and Video File**
This is a file that is used to store digitized sound or digitized video images and animation.

**e. Data File**
This refers to document files, contain data, not programs. Their content are using application software.

### 3.2 File Organization
File are created, arranged and maintained in data processing systems for a purpose of easy retrieval. Computer systems store files permanently on secondary storage devices. Records or files are arranged in several ways on the storage media, and the arrangement determines the manner in which individual records can be accessed or retrieved. Four common ways of file organization and access are:

**a) Serial File Organization**
In this method of file organization records are not arranged in any specific order. If magnetic tapes are used for the storage of data, it would be necessary to wind the tape forward and backward to access a given record since access can only be made in the sequence in which the records were physically stored on the tape, i.e serially. And if records are stored on disk, a full index will be required to access any given record. This method of file organization is therefore inefficient.

**b. Sequential File Organization**
In this type of file organization, data records are normally stored in ascending order of key field. Data must

be retrieved in the same physical sequence in which they are stored.
It is the only file organization method that can be used on magnetic tapes. Magnetic tape is a sequential storage device. That is, records and files are stored in magnetic tape in a sequential order. They are also read in sequential order. Note that records may also be stored sequentially on disk if desired. Serial and sequential file access mean the same thing in respect of files stored on tapes when stored in sequence but this may not be the same case with disk files as the records accessed serially may not be defined in a key sequence. This sequential file organization method is no longer a popular approach of storing or access record in a file.

**c. Indexed Sequential Organization**

This technique of file organization uses both the sequential and direct access methods. It is widely applied to the storage of record on magnetic disk. It allows sequential file to be manipulated serially as the record are stored in ascending order of key field. In addition it allows direct access storage devices, to beaccessed directly using the indexed sequential access method (ISAM). This access method relies on an index or key fields to locate individual records. An index to a file is similarto how of a book can be used to locate it physical position //on a library shelf. The method requires that data are stored in magnetic or optical disk. For //example, a university could index certain ranges of student s matriculation number 0000 to 1000, 1001 to 2000 and so on. For the computer to find the record with the key field 8888, it would go first to the index, which would give the location of the range in which the key field appears (for example, 8001 to 9000). The computer would then search sequentially (from 8001) to find field 8888

**d. Direct or Random File Organization**

This file organization is utilized with magnetic disk technology. Most computer applications today use this approach for storing records in computer files. In this approach, individual records are stored in a particular sequence of key fields. Thus allowing users to access records in a sequence they desire, without regards to actual physical order on magnetic tapes or disk. With this approach, every record has an address that makes it possible to locate it independently of other records on the storage media.
To allow easy access and retrieval of information an index or table of the key are maintained with the relative record number of the record in storage. In order to retrieve a record, the actual key is looked up in the index with the corresponding record number of the record that matches the key. Once this is found, the address in storage is worked out and the recoded accessed. Records stored with the technique are much faster to be accessed than records store with the sequential file organization. Though they may be more expensive because optic or magnetic disk that ma y be involved for their storage.

### 3.3 Classification of Storage Devices

Storage devices can be classified generally as sequential access or random access. For example, a tape drive is a sequential-access device because to get to record 5 on the tape, the drive needs to pass through points 1, 2, 3 and 4. A disk drive, on the other hand, is a random-access device because it allows the record at any position on the disk to be accessed without passing through all intervening positions.

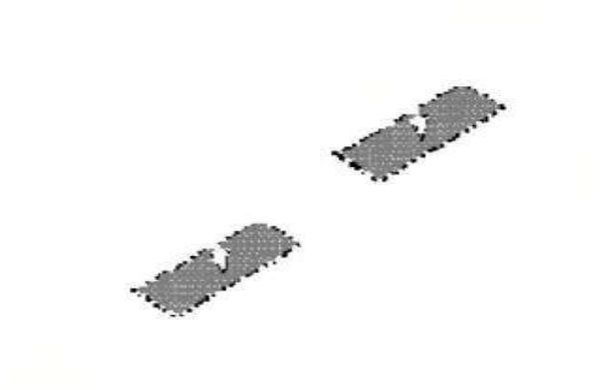


Figure 1: Storage Device Access

### 3.4 Types of data files

Data stored in a data processing centre could be considered as transaction file and master file

**a. Transaction file**

This refers to a collection of transaction records. The transaction file is a temporary holding file that stores records that normally have a limited useful lifetime. For an employee file for a payroll processing, a transaction file would hold, the name, contact information, hour worked, pay rate, tax, utility bills etc for a staff for a particular month.

At the end of every month or so, there will be a need to compute the salaries of the staff from the information in the transaction file. After the transactions are successfully carried out, the information in the transaction file will be use to update the master file. In a data processing system, transaction records ma y be retained online for some period and later achieved off-line on permanent storage devices. Transaction files can serve as audit trails and history for the organization.

**b. Master File**

Master file is a collection of records that are relatively permanent records that are updated periodically. Thus once a record has been added to a master file, it remains in the system indefinitely. The value of fields for the record will change over its lifetime, but the individual records are retained indefinitely. Master files contain descriptive data, such as name and address, as well as summary information, such as students Cumulative, Grade Point Average in an examination processing system or total net pay, total tax deductions in a payroll system. The changes to be made to a master file could be addition of records, deletion of record or update of record. In an organization this will occur when a new staff joins the work force or when a staff resigns his appointment. Furthermore, the master file of a payroll system may be composed of discrete pieces of information (such as a name, address, or employee number etc) called data elements. Data are keyed into the system, updating the data elements periodically. The elements on the master file are combined in different ways to make up periodic reports of interest to management and government agencies or to generate paychecks sent to the staff at the end of the month. Other examples of master file include: Customer, Product, Result or Supplier file.

## 4.0 Conclusion

An effective data processing system is one provides users with timely, accurate, and relevant information. The type and size of devices use for data storage determines how fast information can be retrieved. Two types of data files are described: Transaction and master file -The data in transaction files are regularly used for generating information while data that require periodic updates are moved to the master file.

## 5.0 Summary

In this unit, we explained the meaning of a computer file, described the different types of file organization, and explain the meaning of the terms: transaction and master file. Theses details are vital for the comprehension of the contents in the subsequent units.

## 6.0 Tutor Marked Assignment

Q1 Define the term a computer file
Q2. Explain three main techniques of file organization

## 7.0 References/Further Readings

Jeffery L. Whitten, Lonnie D. Bentley, Kevin C. Dittman, Systems Analysis and Design Methods, McGraw Hill, New York, 2004,

Alexis Leon and Matthew Leon, Fundamental of Information Technology, L & L Consultancy Services Pvt. Ltd, 1999

## UNIT 8: DATA PROCESSING TECHNIQUE

## CONTENTS



### 1.0 Introduction

The processing of data need not be restricted to a particular environment. Data processed in remote locations can be accessed via telecommunications infrastructure. Different kind of processing techniques are made possible by telecommunications. The techniques are discussed in this unit.

### 2.0 Objectives

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

- Definition and explanation of the terms; data and information
- Describe a computer system
- Identify the types of computer
- Describe the basic operations of a computer

### 3.0 Main Content

#### 3.1 Meaning of Data Communication

Data communication refers to the process of transmitting data / information from a source via a telecommunications system in coded forms to a destination for the purpose of interchanging details of business transaction. The transfer of data require some forms of electromagnetic energy such as electricity, light, radio or waves which is transmitted through a physical medium such as the atmosphere, cable or wire.

A telecommunication system refers to a collection of compatible hardware and software required to exchange information from one location to another. A telecommunication system is able to transmit text, graphic images, voice or video information. The major components of a telecommunication system are.

- Computer: This is required for data processing
- Terminals: These are any input/output device that send or receive data
- Communication channel: This is the link by which data, graphic images, voice or video are transmitted between sending and receiving devices in a network. Communication channels use various communications media, such as telephone lines, cable, coaxial cable, fiber-optics and wireless transmission

- Communications software: This controls input and output activities and manages other functions of the communication network

Question: Describe the basic components of a telecommunication system

### 3.2 Batch Processing

This used to be the dominant form of data processing. It is a method of data processing, in which transaction data such as data from time card is collected over a period say, a month for payroll processing, and then processed all at once as a batch to update the master file. A payroll system keeps tracks of the money paid to employees. With this kind of processing, a user may not be able to receive a reliable response from the data processing system until the batch is processed. For instance, if the pay of a staff is computed at the end of the month, it will not be possible to know exactly how much the staff will earn until all the data elements for computing his pay are collated and processed. Another example is a banking system where reconciliation of accounts is done only after the close of day operations and the entire transactions is processed as a batch.

Any queries performed before the batch is processed will certainly not be accurate. However, many banks in Nigeria have begun to integrate real-time modules into their applications.

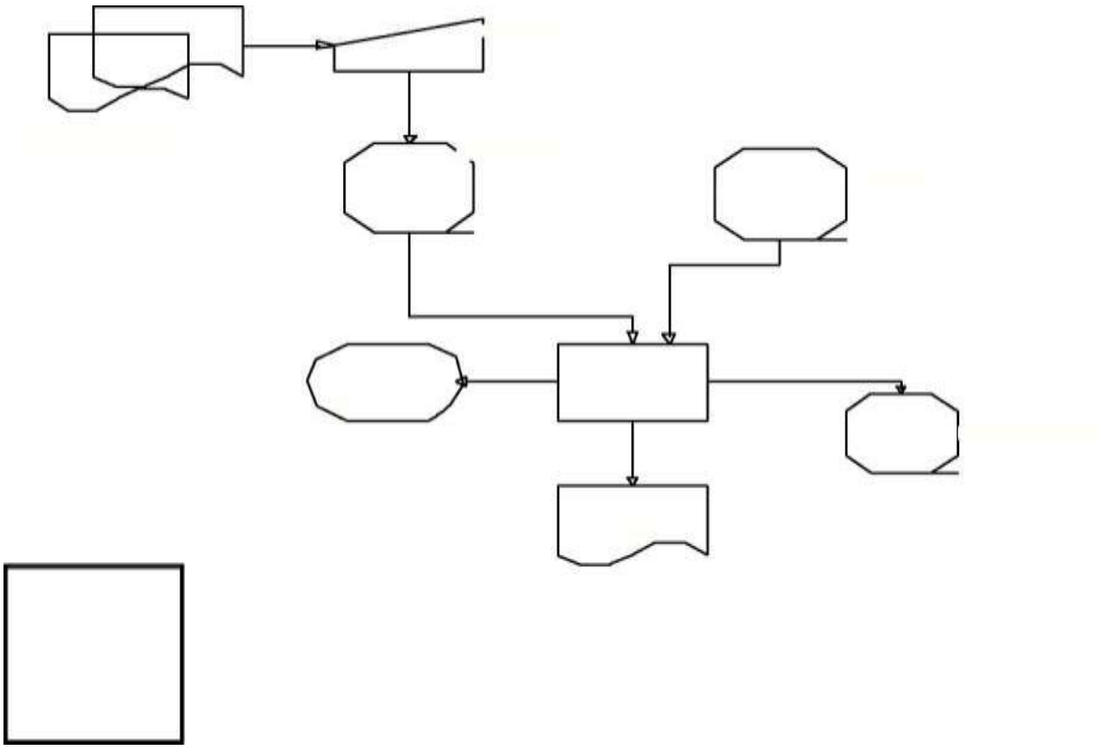


Figure 1: Batch Processing

### 3.3 Online processing

This is a method of data processing method whereby data about a single transaction is processed immediately it is captured. This method of processing allows transactions to be entered directly to the system via terminals, PCs or workstations as they take place thereby updating the master file immediately

as the transactions occur. The point of entry may be remote from the location at which update his made. For example when you withdraw cash from an automated teller machine, your withdrawal is instantly processed and your account balance updated. Other online processing systems include:

- Visa processing
- Result checking
- Banking (account enquiry)
- Air seat reservation
- Application processing
- Examination

Because of the prevalent of PC in data processing we rarely hear the term online processing.
The term client / server computing is more popular where the PC is the client.

### 3.4 Transaction Processing:

Transaction processing system (TPS) is an automated system that performs and records the daily or routine transactions necessary to conduct a business. A transaction may include an order or payment confirmation. Transaction processing entails the updating of appropriate database records as soon as a transaction is captured into the computer. The processing of a transaction may require that a confirmation be sent to the user or a customer immediately. Transaction processing systems are the backbone of an organization because they update constantly. The instant update is a requirement because at any given moment, a customer may need an inventory balance, an account balance or the result of an examination Transaction professing is also referred to as "online transaction processing" (OLTP). This means that the system should be available 24x7 on reliable computers and networks. Common examples of transaction processing systems include: Sales order entry, hotel reservation systems, payroll, examination processing systems, and shopping systems.

### 3.5 Real-time Systems:

These are systems designed to deal with dynamic situations in order to control a critical operation such as an airline reservation system which must be continually updated as events occur. Seat reservation in flight operations require communication-oriented Server computers supported by network of terminals or PCs serving as clients. These facilitate response to enquiries on seat reservations and ensure that the master file is updated as soon as transactions are completed. The systems ensures that enquires on available seat are responded to instantaneously and prevents double, or overbooking of seat in the aircraft.

### 3.6 Distributed Processing:

Many organizations that were used to centralized systems for data processing are now able to adopt Distributed data processing because of advances in computing technologies.
A centralized system consists of a central multi-user computer (usually mainframe) which hosts all components of a data processing system. The users interact with this host via terminals or PCs serving as client, but virtually all of the actual processing and work is done on the host computer. All the devices in the centralized system such as PCs, terminals, network devices, and printer converge on one central computer, even though the users ma y work from remote locations via terminals. All processing and storage take place at the central location. On the other hand, a distributed system allows the components of data processing system to be made available at multiple locations in a computer network. Which means that, the processing workload required for supporting the components is also distributed across multiple computer on the network. In addition, the computers, storage devices, and even some computer personnel may need to be distributed to separate locations throughout the organization for the efficiency of the system. Distributed data processing allows data processing and storage to occur at several locations in the computer system. There are advantages and disadvantaged associated with adopting distributed data

processing in an organization. And these are as follow:

**Advantages of Distributed Data Processing**

- Modularity Easy Integration
- Better response time Data processing is closer to the end user.
- Ability to share data
- Greater reliability
- Local control of data
- Lower cost
- Direct Users interaction

**Disadvantages of Distributed Data Processing**

- Technical problem of connecting and maintaining dissimilar systems
- Need for sophisticated communication system may incur addition cost
- Data integrity and security problem resulting from possible duplication of data on several systems along the network
- Interoperability issues- technical problem of connecting dissimilar machines
- Lack of skilled professional for systems support

## 4.0 Conclusion

Some of the processing techniques studied in this unit are closely related but with a little difference in meaning. For example, an on-line system need not be a real-time system but a real-time system must be an online system.

## 5.0 Summary

An important feature in modern organizations is the need for users to access and use data from different computers at anytime. Timely availability of information enhances decision making. In this unit we studied the main data processing techniques.

**Tutor Marked Assignment**

Q1. What are the advantages and disadvantages of Distributed Data Process?
Q2 Explain the terms Batch Processing Online processing Transaction Processing:
Real-time Systems

## 7.0 References/Further Readings

R G Anderson, Data Processing, Volume 1: Principles and Practice, Pitman Publishing, Singapore, 1990
Alexis Leon and Matthew Leon, Fundamental of Information Technology, L & L Consultancy Services Pvt. Ltd, 1999

## UNIT 9: TRADITIONAL FILE SYSTEM PROCESSING

**CONTENTS**



### 1.0 Introduction

File systems were really an early attempt to computerize the manual systems that were prevalent in the early days of data processing. The manual system works well while there are not many items, but it breaks down when we have a lot of items and we want to cross reference them. So the file based system was a response to industry needs for more efficient data access. However, rather than have everything centralized, each department would have their own set of files. File system which is also referred to as a traditional approach of file processing is inadequate for many organizations because it involves creating, organizing, storing, manipulating and maintaining records within an organization that leads to each functional area or department creating and maintaining its own data files and programs.

### 2.0 Objectives

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

- Explain the concept file system
- Identify and explain the problems with the file system

### 3.0 Main Content

### 3.1 Traditional File Systems / Processing

As an organization grows, computer systems and application become more complex. Take an example, a University s computer system that handles student s information. If the data of students are to be kept independently by the units that each student interacts with, for example, Registration, Hostel, Accounts, Examination and Records, Students Affairs, Health Centre etc. Worse still, of each department is allowed to keep students information independently in their application, a time comes, when multiple files containing the same records of students will exist in the different units.

As this process goes on for more than five years depending on the number of student s enrollment, the university is saddled with hundreds of programs and applications without adequate control on the data The University will be collecting the same information in more than one file. Some of the resulting problems are data redundancy, lack of data integrity and lack program-data dependence, inflexibility, and inability to share data among applications.

### 3.2 Problem with the Traditional File System

Some problems with the tradition file environment are: Data Dependence, Program-Data Dependence, and Difficulty of Data-Sharing. These are discussed as follow:

**a) Data Redundancy**

This means the presence of duplicate data in multiple data files and often in different format. This is often the result, when different departments are allowed to collect the same piece of information about an object. For instance, within the university environment, the hostels and student registration department might collect the same student s information (Name, Mat No, Level and Address). Because it is collected and maintained in so many different places, the same data items may be repeated in different departments. When data fields are repeated in different files, storage spaces is wasted and a lot of time is spent trying to update the records.

**b) Program-Data Dependence**

Program-Data Dependence is the tight relationship between data stored in files and the specific programs that process the information in the files. Where computer programs become so data specific, any changes in data would also mean any modification of in the program the processes them. Such changes could be very expensive in terms of the time and cost of re-programming

**c) Difficulty of Data-Sharing**

It is difficult to share data in a file environment because it ma y be difficult to relate the data in one file with that of another within one or several departments were files are kept.
In addition, there is no control over the access to data which makes it further more difficult to retrieve the desired information.

### 4.0 Conclusion

The file systems lead to a situation, where an organization collects the same information in far too many files. Some of the resulting problems are Data Dependence, Program- Data Dependence, and Difficulty of Data-Sharing amongst several others.

### 5.0 Summary

In a data processing center, there is a need to plan for how the data will be managed from the onset. Most organizations began information processing on small scale, automating one application at a time until there is no more control over the data. Understanding the problems of file based systems may prevent us from repeating these problems. Traditional file based systems are the predecessor to database systems. We shall discuss the database systems in the next unit.

### 6.0 Tutor Marked Assignment

Q1. Explain three main problems with the Traditional File System

### 7.0 References/Further Readings

Alexis Leon and Matthew Leon, Fundamental of Information Technology, L & L Consultancy Services Pvt. Ltd, 1999

R G Anderson, Data Processing, Volume 1: Principles and Practice, Pitman Publishing, Singapore, 1990

**Module 3;**

**UNIT 10: DATA BASE PROCESSING**

**UNIT11: DATA PROCESSING PERSONNEL**

**UNIT12: TOOLS FOR CREATING DATA PROCESSING**

**UNIT 13: VISUAL AND EVENT PROGRAMMING**

**UNIT 14: SYSTEM**

**UNIT 15: SYSTEM CLASSIFICATION**

**UNIT 16: FILE PROCESSING**

## UNIT 10: DATABASE PROCESSING
## CONTENTS



### 1.0 Introduction

The data base technology is an answer to the traditional file system. It helps to solve many of the problems associated with the traditional file organization. A database is a collection of more than one related files which are usually integrated. Also, a database can be seen as a collection of data organized to serve many applications efficiently by centralizing the data and minimizing redundant data. So, instead of storing data in separate files for each application, data are stored physically to appear to users as if they are being stored in only one location. In this way, a single database would be made to service multiple applications. Database technology has a lot to offer in the management of an organization s data though not without some demerits.

### 2.0 Objectives

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

- Explain the meaning of the term database
- Meaning of the term Database Management System (DBMS)

- Components of the DBMS environment.
- Identify merits and demerits of DBMS

## 3.0 Main Content

### 3.1 Database Management System

A database is a collection of data stored in a standardized format, designed to be shared by multiple users. A database management system (DBMS) is software that defines a database, stores the data, support a query language, produce reports, and create data entry screen. Some of the most challenging problems in building applications arise in storing and retrieving data. Problem include conserving space, retrieving data rapidly, sharing data with multiple users at the same time, and providing backup and recovery of the data.

A Data Base Management System being a complex set of software programs that controls the organization, storage, management, and retrieval of data in a database helps to resolve the challenges of building data processing applications. The DBMS acts as an interface between application programs and the physical data files.Let take the student information system, instead of storing data in separate system and separate files for medical, hostel, finance, exams and records, registration, the university would only need to create a database.

In the figure below as single database is created for the processing of students results and the handling of registration information.

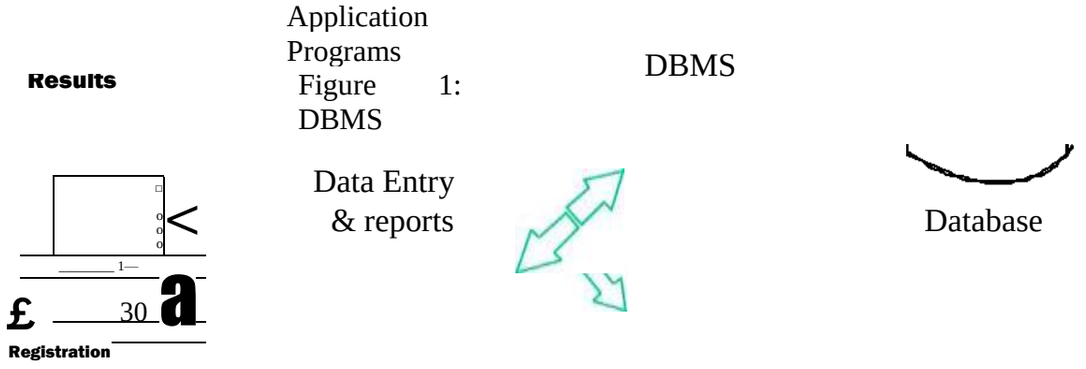



Figure 1: DBMS

When the application programs calls for a data item such as Matric no, the DBMS finds the item in the database and presents it to the application program. With the traditional data files, the programmer would need to provide adequate information in the program of how the computer would locate a data item that has already been defined. With the use of a DBMS, most of the data definition statements found in traditional programs would not be necessary. A DMBS makes it possible to do many routine task that otherwise would be difficult, time consuming and boring without the services of the computer.

A DMBS provides a convenient interface to create and maintain a database and enable individual business applications to extract the data they need without having to create separate files or data definitions in their computer programs. Examples common DBMSs include: Oracle, DB2, Sybase Adaptive Server Enterprise, Datawasp, FileMaker, Firebird, Ingress, Informix, Microsoft Access , Microsoft SQL Server, Microsoft Visual FoxPro, MySQL, PostgreSQL, Progress, SQLite.

**Components of a Database Management System**

A database management system has three components. A data definition language, Data manipulation language and a dictionary

a. A data definition language is the component of a database management system that defines each data as it appears in the database. A data definition language is the formal language used by programmer to specify the content and structure of the database. The data definition language defines each element as it appears in the database before the data element is translated into the forms required by application programs.
b. A data manipulation language is a language associated with a database management system that is employed by end users and programmers to manipulate data in the database. Most DBMS have a specialized language called a
data manipulation language that is used in conjunction with some conventional third or fourth generation programming language to manipulate the data in the database. The language contains commands that permit end users and programming specialist to extract data from the database to satisfy information requests and develop applications. The most prominent data manipulation language today is Structured Query Language, or SQL. Complex programming tasks cannot be performed efficiently with typical data manipulation language.
Most mainframe DBMS are compatible with COBOL, FORTRAN and other modern programming languages, permitting greater processing efficiency and flexibility.

c. Data dictionary: This is an automated or manual file that stores definitions of data elements and data characteristics such as usage, physical representation, ownership (who in the organization is responsible for maintain the data), authorization, and security. It is the third element of a DBMS. Many data dictionaries can produce lists and reports of data utilization, groupings, program location, etc.

### 3.2 Database Model

We shall examine four major database models:

#### a. Relational Database

The relational database model is the most recent of the three database model and overcomes some the limitations of the other two models. In relational database, files are organizes in tables called a relation which is a two-dimensional table of data consisting of columns and rows. A relation is also called an entity or record. A record is made up of related fields that are uniquely identified by field name also referred to as data element or attributes. The fields are used to store data containing values relating to a particular relation which may be employee or student registration record.

Table 10.1 shows a student record database which holds details of students Matriculation number, Name, department and level Fields.

| Matric Number | Name | Department | Level |
|---|---|---|---|
| NOU050010456 | Sonekan Tunde | Accounting | 400 |
| NOU050010457 | Daramola Kola | Mathematics | 400 |
| NOU050010459 | Akinlabi Oluwafemi | Economics | 400 |

Figure 2: Relational Database

**b. Hierarchical Database**

In hierarchical database, records are organized in a treelike structure by type. The relationship between records types is said to be a parent-child relationship, in which any child type relate only to a single parent type. A record is subdivided into segments that are connected to each other in one-to-many parent-child relationship. The most common hierarchical DMBS is IBM S IMS (Information Management System).

**c. Network Database**

The network model is a database model conceived as a flexible way of representing objects and their relationships. It is similar to the hierarchical structure except that any one record type can relate to any number of other record types. Network data model present a logical database model that is useful for depicting many-to-many relationship. Like the hierarchical structure, the network database structure is used in older mainframe system.

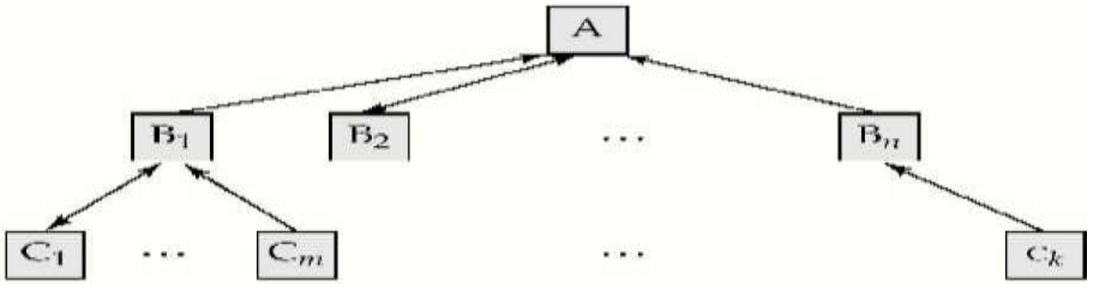



Figure 3: Network Database

### d. Object-oriented database

An object-oriented database is a newer structure that recently has been generating a great deal of interest. This structure groups data items and their associated characteristics, attributes, and procedures into complex items called objects. Physically, an object can be anything: a product, an event, a house, an appliance, a textile, an art piece a toy, or a customer complaint. An object is defined by its characteristics, attributes, and procedures. Objects characteristics can be test, sound, graphics, and video. Examples of attributes might be color, size, style, quantity, and price. A procedure refers to the processing or handling that can be associated with the object.

## 3.3 Merits of a DBMS

- Encourages strategic use of corporate data
- Reduced complexity of the organization s information systems environment
- Reduced data redundancy and inconsistency
- Application-data independence
- Reduced application development and maintenance costs
- Improved flexibility of information systems
- Avoids duplicate data
- Increased access and availability of data and information
- Logical & Physical data independence Control of data redundancy
- Data consistency
- Sharing of data
- Improved data integrity
- Improved maintenance through data independence.
- Minimal data redundancy
- Integration of data
- Improved integrity
- Consistent security
- Increased productivity

## 3.4. Demerits of DBMS

- Complexity
- Cost of DBMS
- Cost of conversion
- Higher impact of a failure

- Additional Hardware Costs
- Take a long time to design and implement
- Performance
- Experts -Specialized Personnel
- Potential organizational Conflict

## 4.0 Conclusion

In an ideal database management system, the data in the database are defined only once and used for all data processing applications whose data reside in the database, thereby eliminating data redundancy and inconsistency. As data processing applications request data elements from the database, the data elements called for by the application are found and delivered by the DBMS. This enhances both the productivity of the application developer and end user.

## 5.0 Summary

The use of a suitable Database Management System for data processing can reduce program-data dependence along with program development and maintenance cost. Access and availability of information can be increased because user and programmers
can perform impromptu queries of data in the database. However, the use of DBMS may lead to additional hardware costs, higher impact on failure and the introduction of some complexities amongst other demerits.

## 6.0 Tutor Marked Assignment

Q1. What do you consider as the major differences between hierarchical database and network database?

## 7.0 References/Further Readings

Gerald V. Post, Database Management Systems, Designing and Building Business Applications, Third Edition, McGraw-Hill, 2005

Management Information Systems, Organization and Technology in the Kenneth C. Laudon, Jane P. Laudon, Prentice Hall International, Inc, 2000

Jeffery L. Whitten, Lonnie D. Bentley, Kevin C. Dittman, Systems Analysis and Design Methods, McGraw Hill, New York, 2004,

## UNIT 11: DATA PROCESSING PERSONNEL

## CONTENTS



### 1.0 Introduction

The categories and number of staff that are found in a data processing center will largely depend on the size of the organization and the volume of work handled by the department. In any typical data processing center the following categories of staff will be found performing various duties:

### 2.0 Objectives

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

- Identify and outline the duties of various data processing personnel

### 3.1 Data Processing Manager

The head of a data processing department: The duties of a data processing manager are summarized as follows:

- Interprets and executes the data processing policy as defined by management
- Controls immediate subordinate in the attainment of project objectives
- Participates in the formulation of data processing policy
- Ensures that security policies are enforced
- Coordinates all data processing operations and ensures the work flow is smooth.
- Ensures that computer operating instructions are modified when the need arises
- Assess and review the effectiveness of all data processing procedures
- Ensures that right software and hardware are purchased and used
- Monitoring test runs;
- Supervises post-implementation evaluation
- Ensures than training policy are implemented for staff
- Assesses the performance of staff for salary review and promotion
- Resolves between subordinates
- Provides leadership on data processing problems
- Develops and implements data processing standards

### 3.2 Systems Analyst

The duties of System Analyst are summarized as follows:

- Liaises with the user departments to ensure their requirements and problem fully captured are before systems design and implementation takes place.

- Interprets terms of reference before embarking upon systems projects
- Studies the feasibility report before embarking on a systems development project
- Supervises, Organizes and coordinates the activities of subordinate staff
- Reviewing Performance of subordinates for appropriate recommendations to the Data processing manager
- Organizes and reviews systems documentations to ensure its compliance with data processing standards
- Studies, reviews and report progress on projects to the data processing manager
- Coordinates the development and implementation alternative systems
- Reviewing performance of implemented systems and assessing the need for amendments or additional training of staff
- Discusses project proposal with subordinates such as the chief programmer

### 3.3 Computer Programmers

The principal duties of computer programmers are summarized as follow:

- Liaise with system analyst to determine philosophy of proposed systems and establish the type of programming language to use high level or assembly code
- Reviews systems specification to establish the details of system requirements before actual implementation(coding)
- Converts systems specification and design documents to actual products
- Develops, implements and maintains computer software
- Deploys and configures software in the specified environments
- Handles integration and interoperability associated issues
- Develops software that are users friendly
- Chooses test cases and monitor test runs
- Reviews the performances of subordinates
- Reports status of program development to systems analyst

### 3.4 Operation Manager

The principal duties of the operations manager are summarized as follow:

- Controls all operations activities such as data preparation, capture and control, processing of data, report generation, storing of data, preservation of backup devices etc
- Develops the operating schedule for all jobs to be run on the computer
- Ensures that data is received on time from users department
- Maintains records on equipment utilizations
- Implements standard procedures to improve the efficiency of operations
- Keeps the inventory of data processing hardware supplies such as tapes, disk, hard drive, Monitors, etc
- Maintains log of computer operations for audit trails
- Reports to superior when system problems and other operational matters arise

### 3.5 Database Administrator

The principal duties of database administrators are summarized as follows:

- Implements the specific policies and procedure through which data can be managed as an organizational resource.
- Plans for data usage
- Oversees the logical and physical database design and data dictionary development.
- Formulate information policy that specifies its rules for sharing, disseminating, acquiring, standardizing, classifying, and inventorying information in a organization
- Specifies rules governing the maintenance, distribution, and use of information in an organization

- Define and organizes database structure and content
- Develops security procedure to safeguard the database
- Develops database documentation
- Maintains the database management software

## 4.0 Conclusion

In modern days, the data processing department may be referred to as Information Technology department. Thus, the staff may be known with different nomenclature such as Information Analyst for Systems Analyst; Software Engineer for Programmer; System Support Manager for Operation Manager etc.

## 5.0 Summary

In this unit, the main duties of data processing personnel were covered. In the next unit we shall discuss the tools for creating data processing applications.

## 6.0 Tutor Marked Assignment

What are the duties of a systems analyst?

## 7.0 References/Further Readings

R G Anderson, Data Processing, Volume 1: Principles and Practice, Pitman Publishing, Singapore, 1990

## UNIT12: TOOLS FOR CREATING DATA PROCESSING

## CONTENTS



### 1.0 Introduction

No matter the computer infrastructure in place for data processing - a standalone PC, a small peer-to-peer network, or a wide area network, having the right software is a major requirement for good productivity. Depending on the organization, one or more of the following software would be required for data processing:

Accounting software
Bank management software
Retail point-of-sale software
Financial planning software
Legal and medical office Management systems
Medical diagnostic software
Insurance claims processing system
Report generator Application

Software is developed by using programming languages or other software development tools. The following section explains how software programs functions and describes the processes and tool that developers use to create software

Programming is way of communicating with the computer via instructions to perform some tasks. Though hundreds of computer programming languages are now use they are broadly classified into three levels: Machine languages, assembly languages, and high- level languages.

### 2.0 Objectives

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

- List some data processing software
- Describe some programming languages
- Explain the term structured programming
- Explain the term object oriented programming

### 3.1 Machine languages

Machine Language: are the most basic languages for computer systems. Machine languages consist of strings of numbers defined by hardware design. Each type of CPU has its own machine language. Thus machine language programs vary from computer to computer; that is, they are machine dependent For example, the Intel Pentium and Motorola PowerPC understand different machine languages. The

instructions in Machine language are written in 0 and 1. These binary digits, which correspond to the on and off electrical states of the computer, clearly are not convenient for people to read, write or use. Thus to provide the machine-language instructions to accomplish a simple task such as finding the sum of 2 numbers the program may look like:

101100101001 1001011111
111011011101 0101001011
100001010010 1010010010

### 3.2 Assembler Language

Assembly languages were developed by using English-like mnemonics for commonly used strings of machine language. Instead of writing programs as a sequence of bits, assembly language allows programmers to write programs by using abbreviation or easily remembered words instead of numbers. This is just a level above machine language. Assembly language makes use of certain mnemonics (e.g., LOAD, ADD) and assign address and storage locations automatically. We may use ADD to add a value to the content of a memory cell into a register. A program written in assembly language may look like this:

Load
A
Add
B
Store
C

A programmer can write instructions in assembly language more quickly and much easily than in machine language. Although assembly language gives programmers some level of control, it is still costly in terms of programmer s time and effort: it is also difficult to read, debug, and learn. Assembly language is used primarily today in system software. Another drawback is that, like machine language, assembly language varies from computer to computer. That is, it is machine dependent. Instructions written in assembly language require an assembly to be translated into machine-language equivalents.

### 3.3 High-Level Language

High-level languages were developed to make programming easier. These languages are called high level languages because their syntax is closer to human language than assembler or machine language code. They use familiar words instead of communicating in the in machine codes which are not general and difficult to comprehend. In writing instructions in these languages, familiar arithmetic operators, such as the plus (+), or
minus (-) sign that are used. This makes the reading, writing, and understanding of computer programs much easier with a high level language. Please, note that instructions in written in high-level languages must be translated to machine code equivalents before they can be executed by the computer. Common examples that can be used for application development are discussed below:

#### a. FORTRAN (FORmula TRANslator)

This is one of the early languages developed in 1950s to allow programmers write codes faster than using assembly languages. It was invented primarily for the development of scientific and engineering applications. It is a programming language intended for mathematical computation and allows programmer to express numerical equations directly. The language, which enjoyed immediate and widespread acceptance, has been enhanced several times. FORTRAN has not been widely used with personal computers. Instead, FORTARN remains a common language on mainframe systems especially those used for research and education.

A mathematical expression in FORTRAN can simply be written as:

C= A+B

**b. COBOL (Common Business Oriented Language)**

This language was developed in 1960 by a government-appointed committee under the leadership of retired Navy Commodore and Mathematician Grace Hopper. The committee was set out to address the problem of incompatibilities among computer manufactures. The committee came up with a platform independent language called COBOL. The language was intended for business data processing applications. It gained a very wide acceptance partly because of the support from the government. A COBOL program is made up of four divisions Identification, Environment, Data and Procedure. The divisions in turn are broken down into sections, which are divided into paragraphs, which are further divided into sentences. The Identification Division is used to provide some documentation on the name of the program, what the program does and the author (programmer) and perhaps some other helpful comments. The Environment Division provides a description of the computer on which the program will be compiled and executed. The Data Division provides information that describes what data will be processed. The actual instructions or commands that the computer should follow in accomplishing given tasks are written in the Procedure Division COBOL is machine independent and can handle many files and records.

A typical instruction that may be written in the Procedure Division is as follows: ADD SCORE_IN_PAPER1 TO SCORE_PAPER_2. The capability of COBOL for file processing makes it suitable for developing data processing applications. However, the advent of Database Management Systems with Languages that that can easily manipulate them has made COBOL unpopular for data processing in recent times. Also, COBOL is not very suitable for handling mathematical processing.

A sample code in COBOL language is written below:

```
DATA  DIVISION.
FILE SECTION.
FD Stud File.
1     Stud Details.
    88 End Of Stud File VALUE HIGH -VALUES. 02
          Stud Mat No       PIC 9(7).
    2     Stud Name.
          3     Surname     PIC X(8).
    02    Date Of Birth.
          03 Birth Year     PIC 9(4 ).
          03 Birth Mnt      PIC 9(2).
          03 Birth Day      PIC 9(2).
    02    Course Code       PIC X(3).
    02    Gender            PIC X.



PROCEDURE  DIVISION.
Begin.
    OPEN INPUT Stud File
    READ Stud File AT END
    END-READ
    PERFORM UNTIL End Of Stud File
```

```
    DISPLAY Stud Id SPACE Stud Name SPACE Course Code
    READ Stud File
        AT END SET End Of Stud File TO
TRUE END-READ END-PERFORM CLOSE
Stud File STOP RUN.
```

**c.** BASIC (Beginners All-Purpose Symbolic Instructions Code)

This language was developed by John Kemeny and Thomas Kurtz at Dartmouth College in the mid 1960 as an easy-to-learn, interactive alternative to FORTRAN especially for beginning programmers. It was a suitable tool for teaching programming to students. It was the first high-level language to be implemented on PCs because of its simplicity. This further led to its popularity amongst developers, hobbyist and students. Several versions of BASIC language exist today among which is Visual BASIC (VB) - the most popular programming language ever created. We shall deal more extensively on VB later in this course.

### 3.3 OTHER TOOLS

There are a good number of tools which are much users-oriented and allow programmers to develop applications with fewer commands, although they also require more computing power. These consist of report generators, query languages and applications generators

a. **Report Generators**:

These are also called report writes. They are programs for end-user which are used to produce reports. They allow reports to be generated directly to as printout or a screen display. The items to be generated may be the outcomes of a database queries. You can specify the format such as header, footers, column, heading, etc in advance. The report generator will produce data in the specified format.

b. **Query Language**:

A query language is a users friendly language for retrieving information a database management system. It serves as a database user interface, hiding the intricacies of the database from the user. The query may be expressed in the form of a sentence or near English-like statements. They can also be obtained as choices from a menu driven application. Common examples of a Query language are SQL (Structured Query Language), INTELLECT, QBE, DATATRIEVE, PDQ, and INQUIRE.

c. **Application generator**:

Application generator is a programmer s tool that is capable of generating applications program from problem description rather than by traditional programming. With application generators parts of the codes required by a programmer are easily created. This reduces the programming time and efforts required for software development. For example, routine for capturing data, generating report and accessing database can easily be generated by the application generator. This routines can be used at some points the development of current or other applications. Where you application is unique, the application generator will provide a module that permits you to enter program code that will attend to those unique parts. Some examples of application generators are SAS, MATISS, PACBASE, NATURAL, UFO etc.

d. **CASE (Computer-aided software engineering**)

CASE is an acronym for Computer-aided software engineering or Computer-aided systems engineering. It is the automation of the step-by-step methodologies for software and system development to enhance the developer s productivity. CASE tools provide automated graphics facilities for producing graphs, charts, and reports, data dictionaries, analysis and checking tools, code and documentation generators for easy software production

## 3.4 Approaches to Programming

It was only in from the early 1960s, that structure was imposed on how programmers wrote codes. Two popular approaches to programming are Structured Programming and Object Oriented Programming

### a. Structured Programming

Structured programming was developed in an attempt to overcome the use of GO TO statements in programming. Structured programming is a technique to make the programming process easier and more productive. A structured program doesn't depend on the GO TO statement to control the logical flow. Instead, it is built from smaller program called module, or subprograms, which are in turn made up of even smaller modules. The programmer combines module using the three basic control structures: sequence, repetition, and selection. Structured Programming evolved in the 1960 and 1970s.

**Sequence Construct**

This executes statements in the order in which theyappear, with control passing unconditionally from one statement to the next. The program will execute statement X and proceed to statement Y. See Figure 1.

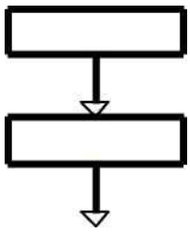


Figure 1: Sequence Construct

**Selection Construct**
This tests a condition results of the test. A test is result is false, statement Y Figure 2

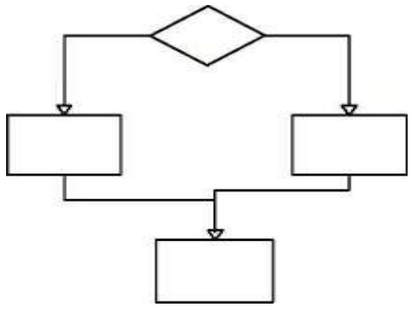


Figure 2: Selection Construct

and executes one of two alternatives instructions based on the performed. If the result is true, Statement X is executed. If the is executed. Control then passes to the next statement (Z). See

**Iteration construct**
The Iteration construct repeats a segment of code as long as a conditional test remains true. A test is performed. If the result is true, statement X is executed and control returns to the test. If the result is false, control passes to the next statement.

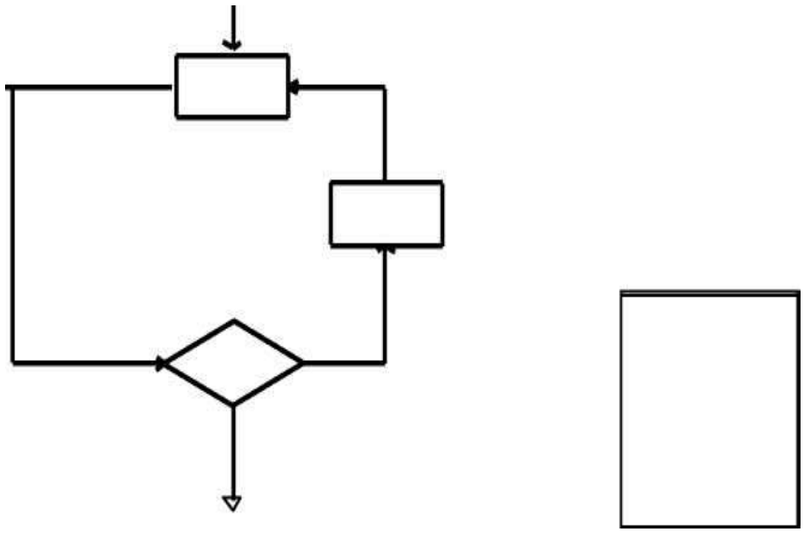


Figure 3: Iteration Construct

### 3.5 Limitation of Structured Programming

Software developers have found that using structured programming results in improved efficiency, but there had been some challenges with the process of building software quickly and correctly. As applications become larger and more complex, the complexity of the application increases, so does, the number of persons-years required to complete the project. One proven approach to handling this increase in complexity is object- oriented programming. Object oriented programming allows the reuse of code. Reusing code allows programs to be built quickly and correctly. OOP builds on and enhances structured programming.

### b. Object-Oriented Programming:

Object-oriented programming (OOP) is a programming approach that combines data and instructions for processing that data into a self-contained object that can be used in other programs. An object is a block of preassembled programming code that is a self- contained module. The module contains, or encapsulates, both (1) a chunk of data (2) the processing instructions that may be performed on that data.

An object can be used several times in different applications and by different programmers, thereby leading to improved productivity of the software developers. Examples of OOP languages; Smalltalk, c++, Eiffel, C#, Java, etc

### 4.0 Conclusion

A computer program is a collection of instructions, or statements (also called codes) carried out by the computer s CPU to perform a task. To be sure that the computer and programmers are able to understand themselves, standard language called computer languages such as FORTRAN, COBOL, ADA, etc are used. Apart from programming with standard languages simplified tools such as report generators, query languages and applications generators are also widely used for software development.

### 5.0 Summary

Object-oriented software development models a system as a series of reusable objects that combine both data and procedure. This leads to a reduction in the time and cost of writing software and also makes maintenance easier.

### 6.0 Tutor Marked Assignment

Q1. Explain the meaning of the following terms;

a) Structured Programming

b) Object Oriented Programming

Q2. What is the meaning of the term CASE?

Q3. State three advantages of Object-oriented Programming

**7.0** References/Further Readings

Problem Solving Using C: Structured Programming Techniques, Second Edition, Yuksel Uckan, McGraw-Hill, 1999

## UNIT 13: VISUAL AND EVENT PROGRAMMING

## CONTENTS



**1.0** Introduction

Visual BASIC, developed by Microsoft in the early 1990s, is one of the most popular visual programming languages. It offers a visual environment for program construction, allowing users to build various applications components using drag-and-drop tool, buttons, scroll bars, and menu. It is a very suitable language for developing user s friendly data processing applications. In this unit we shall provide an overview of the language and explain the relevant features /statements that will enable you develop good data processing applications.

### 2.0 Objectives

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

- Explain the term visual program and event driven programming
- Identify the elements in the Visual Basic environment
- Explain the concept of object, properties and method
- Define the term data types and explain the terms variable and constants
- Use simple assignment statements and expression
- Describe and use mathematical operators
- Write sample program in Visual Basic

### 3.1 Visual and Event-Driven Programming

The increasing use of Windows environments in the 90s led to development of Visual programming languages such as Visual Basic and Visual C++ which support features for to development of Graphical User Interface (GUI) based systems. These programming languages also support event-driven programming and integrate easily with relational database systems to allow the development of complex user interface systems.

Visual programming is a method of creating programs by manipulating program elements graphically rather than by specifying them textually. The programmer makes connections between objects by drawing, pointing and clicking on diagrams.

VB is termed an event-driven programming language because with it you can write program code that responds to events that are controlled by the system or users. Examples of event include:

- Clicking a button or menu.
- Opening or Closing a form.
- Moving the mouse over the top of an object such as a text box.
- Moving from one text box to another.

Before we proceed with learning the VB language we shall define some terms that are required for us for to have a good understanding of the language.

**Object**

An object is a thing like a noun in English. Examples include Forms and Controls on forms such as Buttons, Text boxes, and Icons.

**Property**

Objects have properties like adjectives in English. Properties describe objects. Examples of properties include Text, Name, Back Color, Font, and Size.

**Method**

A method is like a verb in English It is an action word that objects exhibit. Examples include methods to Show and Hide Forms and methods to Print Forms.

**Event**

An event occurs when users takes an action, such as clicking a Button, pressing a key, scrolling, or closing a Window. Events can also be triggered by actions of other objects.

**Form**

A Form is the window and dialog box where you put all the things that people interact with as they use your program. Forms are the foundations you generally use to build programs. Forms are containers for Controls.

Controls are the elements; you place inside a Form, such as Text boxes, Command buttons and List boxes. Those things you put on the form are controls, which enable the people who use your program to do things, such as enter text and click buttons.

## 3.2 Visual Basic Development Environment

The development environment in Visual Basic looks like the environment you have in any other Microsoft product such as Word, Excel, Power point, MS Access etc. It allows you to create and test your programs. The screen shot in Figure 13.1 shows a VB development environment.

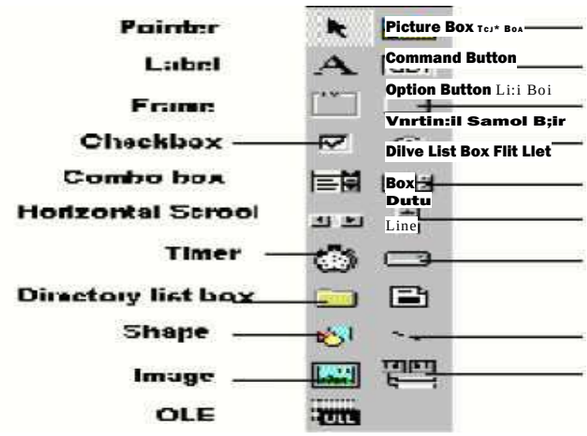



Figure 2: Tool Box

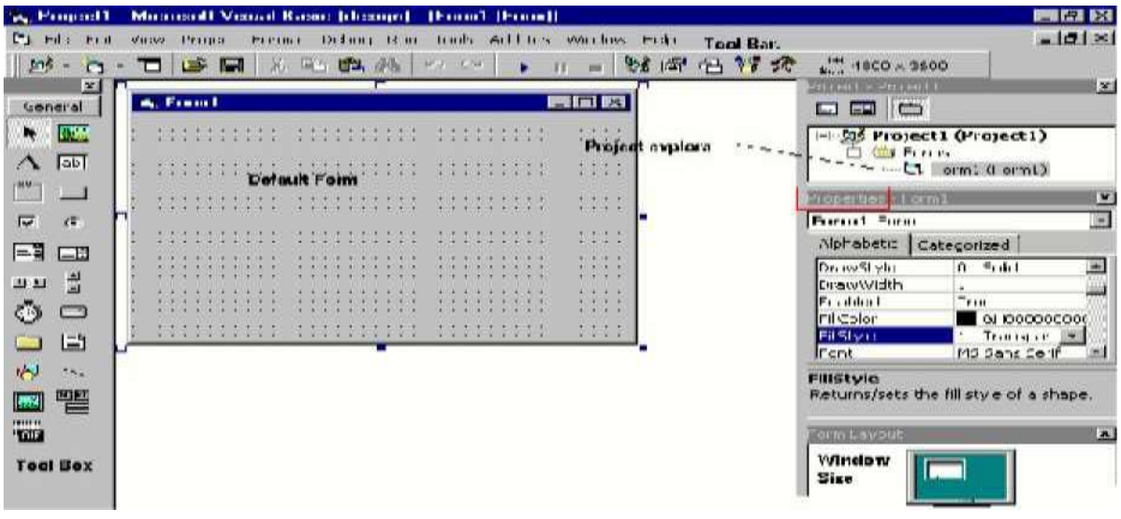



Figure 1: VB IDE

The Tool Box holds the tools you use to place control on the form. All of the controls that appear See Figure xx for detail description of the Control. You may have more or different tools in your toolbox, depending on the edition of Visual Basic you are working with.

Table 1: The visual Basic 6 intrinsic control

| **Control** | **Purpose** |
|---|---|
| Label | To displays text on a form |
| Frame | Serves as a container for other control |
| Check Box | Allows users to select or deselect an option |
| H scroll Bar | Allows users to scroll horizontally through a list of data in another control. |
| Timer | Lets your program perform actions in real time, without users' interaction. |
| Dir List Box | Allows users to select a directory or folder |
| Shape | Use to display a shape on a form |
| Image | Use to display graphic (image) on a form |
| OLE Container | Allow you to add the functionality of another control program to your program. |
| Picture Box | Use to display graphic (image) on a form and ca serve as a container |
| Text box | Used to display text but also enables users to enter or edit new existing text |
| Command Button | Allow users to initiate action |
| Option Button | Allow users select on choice on choice from group, it must be used in groups of more than one |
| List Box | Allows users to select from a list of items |
| V Scroll Bar | Use to scroll vertically through a list of data in another control |
| Drive List Box | Allow users select a dick drive |
| File List Box | Allows users select a file |
| Line | Used to display a line on a form |
| Data | Used to connect a database to a program. |

**3.3** Working with control

Two ways to add control to a form are:
1) By double-clicking
2) By drawing

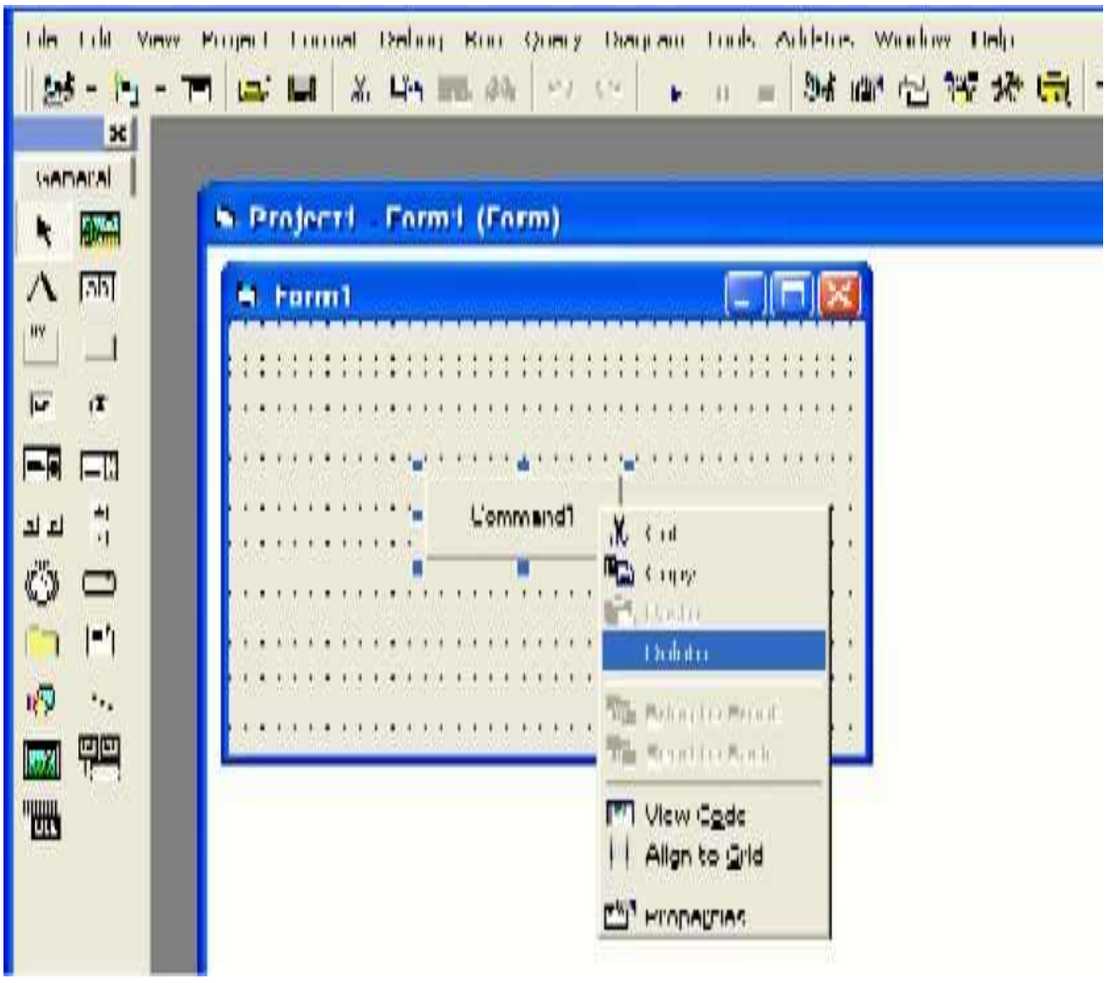
Steps to draw a control on a form

**i.** Click the control's Toolbox icon.
**ii.** Move the mouse pointer over your form. Notice that your pointer is now shaped as a crosshair instead of an arrow. Click (and hold) the mouse button where you want the control to go.
**iii.** Drag the mouse down slightly and to the left. As you move the mouse, notice that a box starts to appear.
**iv.** When the box is the proper size, let go of the mouse button. The control you selected now appears on the form.

Steps to remove a control from a form

**i.** Select the control you want to delete by clicking it.
**ii.** and Press the Delete key.

You can also remove a control by right-clicking it. From the context menu that appears, select


Project1 - Form1 (Form)
Form1
Command1
View Code
Align to Grid

**3.4** Working with Properties, Methods, and Events

Every object, such as a form or control, has a set of properties that describes it. The set of properties are not the same for all objects though some properties

**Table 2: Common Properties of Visual Basic Controls**

| **Property** | **Description** |
|---|---|
| Left | The position of the left side of a control with respect to its container. |
| Top | The position of the top of a control with respect to its container. |
| Height | The height value of a container. |
| Width | The width value of a control |
| Name | The string value used to refer to a control |
| Enabled | (True/False) Value that determines whether users can manipulate the control or not. |
| Visible | The Boolean (True/False) Value the determines whether users can see control or not. |

Methods are blocks of code designed into a control that tells the control how to do things, such as move to another location on a form. Just as with properties, not all controls have the same methods, although some common methods do exist, as shown in Table 3

**Table 3: Common Methods of visual basic control**

| | |
|---|---|
| Move | Changes an objects position in response to response to a code request. |
| Drag | Handles the executive of a drag-and-drop operation by the user. |

| | |
|---|---|
| Set Focus | Gives focus to the object specified in the method call. |
| Z order f | Determines the order in which multiple objects appear on screen. |

Not all controls in VB have the same events, but some events are shared by many controls. These are represented in Table 4.

Table 4: Common Events of Visual Basic Controls

| **Event** | **Occurrence** |
|---|---|
| Change | Their user modifies text in a combo box or textbox. |
| Click | The user clicks the primary mouse button on an object |
| DBL Click | The user double-clicks the primary mouse button on an object |
| Drag Drop | The user drags an object over another location. |
| Drag over | The user drags an object over another control. |
| Got Focus | An object receives focus. |
| Key Down | The user press keyboard key while an object has focus. |
| Key Press | The user presses a and release a keyboard key while an object has focus. |
| Key up | The user releases a keyboard key while an object has focused |
| Lost focus | An object lost focus |
| Mouse down | The user press any mouse button while the mouse pointer is over an object. |
| Mouse move | The user moves the mouse pointer over an object. |
| Mouse up | The user releases any mouse button while the mouse pointer is over an object. |

### 3.5 Writing Procedure for Events

Writing codes VB is an interesting one. Your major task is event-driven programming. VB codes are written to handle events as they occur. The codes are contained within a procedure defined as any block of code that can be called from within your application.

The syntax for a procedure is:

```
[Public |Private] [Static] Sub |Function |Property _
function name (arguments) [As Data type]
{...Your procedure code...}
End Sub| Function| Property
```

An event procedure is the place in your project where you put the code that will run when an event occurs. To write an event procedure, you must access the Code window for your object by doing one of the following:

- Double-clicking the object
- Selecting the object with the mouse and pressing F7
- Selecting the object and choosing Code from the View menu
- Selecting the object's form in the Project Explorer, clicking the View Code button, and choosing the object from the Code window

### 3.6 Using Data Types, Constants, and Variables

Working with variable

A variable is a temporary storage location for data. Variables are used for representing data of certain types. To use a variable, you will have to declare it. By declaring a variable you are asking the compiler to allocate appropriate memory space for the variable based on its data type. The different type of variables in VB and their storage requirements are in the Table 5.

Table 5: Storage Requirements

| **Type** | **Value** | **Storage Size** | **Range** |
|---|---|---|---|
| Boolean | Logical value | 2Bytes | True or false |
| Byte | Whole number | 1 Byte 0.255 | |
| Currency (scale integer) | Numbers with up to 15 digits left of the decimal and 4 digits right of the decimal | 8bytes | 922, 337, 685, 477, 5808 to 922, 337, 203, 685, 477. |
| Date | Date and time information | 8bytes | 1 January 100 to December 9999. |
| Double | Decimal numbers(Double precision floating point | 8bytes | 1.797,69313486232E308 to – 4.9406564584124E -324 for negative value; 4.94065645841247E308 for positive value |
| Integer | Whole numbers | 2 bytes | - 32,768 to 32767 |
| Long | Whole number(long integer) | 4 bytes | -Bytes -2,147,481? 648 to 2,147,483,647. |
| Single | Decimal numbers | 4 bytes | -3.4() 2823E38 to -1.401298E-45 for negative values, 1.401298E-45 to |

| | | | |
|---|---|---|---|
| | | | 3.402823E38 for positive values. |
| String | Text information 1 (fixed-Length) | nengthy of string | 1 to approximately 65,400 |
| Variant | Any of the preceding data types | 16 types +1 byte per character | |

Comments are non executable statements that are included in a program for documentation and clarifications. When used in a program, they describe the purpose of a program, functions, or statement. They do not have any effects on the program. They are represented by REM or in program.

**Naming a variable**

To make your code easy to read and understood your variable names should describe their task but, to make your code easy to type, they should be short as possible. To enhance the understanding of code many programmers prefer to use some standard prefixes on their variables to indicate the type of data of the variable.

**Variable Declaration**

There are many ways to declare a variable is VB. The most common way is to use the Dim statement. The syntax of the Dim statement is: Dim Variable name [As Data type]

The Data type is optional and when it is not specified the default type Variant is assumed.

Examples of variable declaration statements: Dimint Total Number Sold AS Integer Dimcur Total Amount AS Currency Dim str Customer Address AS String Dimint Changing

**Constants**

There are occasions where data items in a program have values that do not change. Such values are referred to as constants. In Visual Basic, there are two main types of constant Intrinsic and Named constant.

**Intrinsic Constants**

These are built in constants or systems defined constants. They are usually stored as library files and available for use by the programmer when they are called: Common examples are color definition constants such as vb Red, vb Blue and Message statements such as vb OK Only, vb Critical, vb Information etc

**Named Constant:**

These are programmer defined constants.
The syntax for Constant declaration is:
Const variable name [As Data type] = value
Const is a reserved word i.e word with a special meaning to the Visual Basic interpreter.
Const strCoursetille AS String = Data Processing Const strDept = Computer Science
Const curDiscount Rate = 0.05

Notice that String values are enclosed in quotation marks while numeric values are not

so enclosed.

### 3.7 Assignment Statements and Assignment Expressions

It is not enough to just declare variables, you need to be able to assign data to variables, manipulate the data and use the content of the variable. To do this, you must write some code statements. A statement is a line of code that makes a computer achieves a task. An assignment statement for example is used to assign a value to a variable. The syntax for assignment statement is as follows:
Variable = expression
Examples:
intNum1 = 5
from Main. Visible = False
fAvgScore = nTotal / nNumber of Papers

Mathematic Operations
The primary reason for using computer in data processing is for the processing of numerical data. Mathematical operations can be used to determine the total deductions or net pay to be paid to an employee when the payroll is processed. Similarly, customers bill, interest due, account balance, and the total score of student in an examination would need some mathematical operation to be performed by the computer. Mathematical operations are performed by mathematical operator. A list of the available Mathematics operator and their corresponding VB operator are provided in Table 7.

| Operation VB Operator | Symbol |
|---|---|
| Addition | + |
| Subtraction | - |
| Multiplication | * |
| Division | / |
| Integer division | \ |
| Modulus | Mod |
| Exponentiation | ^ |

**Table 7: Math Operations**

### 3.8 Sample Program in VB

Now that we have learnt some basics of VB, we will illustrate with a Sample Program.
Question: Develop an application in VB to calculate the Total and Average scores of students in Four papers in an Examination Solution
To develop this application you need go through the following steps:

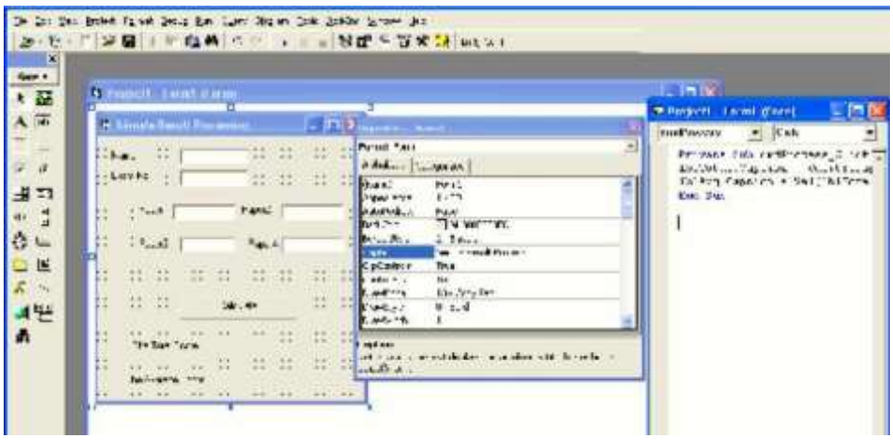
1. Plan and define your users interface (Create your forms and add the appropriate controls)
2. Plan and set the properties (Assign names to your objects. See Figure 5)
3. Plan and Write the Basic codes (Write codes to handle the events. Also see Figure5)

Source Code for command (Process)

Private Sub cmdProcess_Click()

Lbl total. caption = Val(txtPaper1.Text) + Val(txtPaper2.Text) + Val(txtPaper2.Text)+Val(txtPaper4.Text)
lblavg.Caption = Val(lbltotal.caption)
/ 4 End Sub

Figure 5: Users Interface Design and Codes



**4.** Run the program


Figure 1: VB Application for Result Processing **Exercise:**

Develop the same application by repeating steps 1-4

### 4.0 Conclusion

Visual Basic is one of the most popular visual languages and very easy to learn.
However, in order to be able to practice some of the topics covered in this unit, you will need to install Visual Basic 6.0 or Visual Studio.NET Professional edition on your computer.

## 5.0 Summary

This unit covers the Visual Basic Development Environment, and explains the fundamental concepts of event driven and visual programming. Applications written in Visual Basic are very users friendly. The concepts learnt in this unit will be very useful in your programming career and the understanding of the remaining parts of this study material.

## 6.0 Tutor Marked Assignment

Q1. Develop a Visual Basic Application that allows a user to input the cost of items of three products purchased by a named customer from WAZOBIA Nigeria Ltd. When the user clicks on calculate the system would display the total and average costs of the items.
Use appropriate controls to make your program users friendly. Hint: See Figure 1 of this unit.

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**UNIT 14: SYSTEM**

**CONTENTS**



## 1.0 Introduction

A system is a set of interacting or interdependent component parts forming a complex or intricate whole. Every system is delineated by its spatial and temporal boundaries, surrounded and influenced by its environment, described by its structure and purpose and expressed in its functioning.
The term "system" comes from the Latin word systēma, in turn from Greek σύστημα systēma: "whole compounded of several parts or members, system", literary "composition".

## 2.0 Objectives

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

- Explain the term System concepts
- Discuss Subsystem
- Analysis of systems
- Explain the Application of the system concept

## 3.0 Main Content

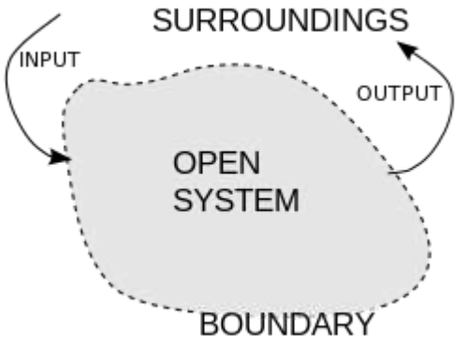
### 3.1 System concepts

**Environment and boundaries**

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

**Natural and human-made systems**

There are natural and human-made (designed) systems. Natural systems may not have an apparent objective but their behavior can be interpreted as purposeful by an observer. Human-made systems are made to satisfy an identified and stated need with purposes that are achieved by the delivery of wanted outputs. Their parts must be related; they must be "designed to work as a coherent entity" – otherwise they would be two or more distinct systems.




**Open systems** have input and output flows, representing exchanges of matter, energy or information with their surroundings.

**Theoretical framework**

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

A closed system exchanges energy, but not matter, with its environment; like Earth or the project Biosphere 2 or 3. An isolated system exchanges neither matter nor energy with its environment. A theoretical example of such system is the Universe.

**Process and transformation process**

An open system can also be viewed as a bounded transformation process, that is, a black box that is a process or collection of processes that transforms inputs into outputs. Inputs are consumed; outputs are produced. The concept of input and output here is very broad. For example, an output of a passenger ship is the movement of people from departure to destination.

**System model**

A system comprises multiple views. Man-made systems may have such views as concept, analysis, design, implementation, deployment, structure, behavior, input data, and output data views. A system model is required to describe and represent all these multiple views.

**Systems architecture**

A systems architecture, using one single integrated model for the description of multiple views such as concept, analysis, design, implementation, deployment, structure, behavior, structure-behavior coalescence, input data, and output data views, is a kind of system model.

**3.2 Subsystem**

A subsystem is a set of elements, which is a system itself, and a component of a larger system.
A subsystem description is a system object that contains information defining the characteristics of an operating environment controlled by the system.

**3.3 Analysis of systems**

Evidently, there are many types of systems that can be analyzed both quantitatively and qualitatively. For example, with an analysis of urban systems dynamics, A.W. Steiss defines five intersecting systems, including the physical subsystem and behavioral system. For sociological models influenced by systems theory, where Kenneth D. Bailey defines systems in terms of conceptual, concrete and abstract systems, either isolated, closed, or open, Walter F. Buckley defines social systems in sociology in terms of mechanical, organic, and process models.
Bela H. Banathy cautions that with any inquiry into a system that understanding the type of system is crucial, and defines Natural and Designed systems.

Systems that are purposed by man inherently have a major flaw: they must have a starting assumption(s) which is used to build further knowledge upon. This starting assumption(s) is not inherently bad, but it

is used as the foundation of the system and as it is assumed to be true, if it is not definitively so then the system is not as structurally sound as it is perceived to be. For example, in Geometry (a subsystem of Math) this is highly evident when one goes through the process of taking theorems and extrapolates proofs from those set theorems.
In offering these more global definitions, the author maintains that it is important not to confuse one for the other. The theorist explains that natural systems include sub-atomic systems, living systems, the solar system, the galactic system and the Universe. Designed systems are our creations, our physical structures, hybrid systems which include natural and designed systems, and our conceptual knowledge. The human element of organization and activities is emphasized with their relevant abstract systems and representations. A key consideration in making distinctions among various types of systems is to determine how much freedom the system has to select purpose, goals, methods, tools, etc. and how widely is the freedom to select itself distributed (or concentrated) in the system.
George J. Klir maintains that no "classification is complete and perfect for all purposes," and defines systems in terms of abstract, real, and conceptual physical systems, bounded and unbounded systems, discrete to continuous, pulse to hybrid systems, etc. The interactions between systems and their environments are categorized in terms of relatively closed and open systems. It seems most unlikely that an absolutely closed system can exist or, if it did, that it could be known by us. Important distinctions have also been made between hard and soft systems. Hard systems are technical in nature and amenable to methods such as systems engineering, operations research and quantitative systems analysis. Soft systems involve people and organisations and are commonly associated with concepts developed by Peter Checkland and Brian Wilson through Soft Systems Methodology (SSM) involving methods such as action research and emphasizing participatory designs. Where hard systems might be identified as more "scientific," the distinction between them is actually often hard to define.

### 3.3.1 Cultural system

A cultural system may be defined as the interaction of different elements of culture. While a cultural system is quite different from a social system, sometimes both systems together are referred to as the socio cultural system. A major concern in the social sciences is the problem of order.

### 3.3.2 Economic system

An economic system is a mechanism (social institution) which deals with the production, distribution and consumption of goods and services in a particular society. The economic system is composed of people, institutions and their relationships to resources, such as the convention of property. It addresses the problems of economics, like the allocation and scarcity of resources.

## 3.4 Applications of the system concept

A system modeling is generally a basic principle in engineering and in social sciences. The system is the representation of the entities under concern. Hence inclusion to or exclusion from system context is dependent of the intention of the modeler. No model of a system will include all features of the real system of concern, and no model of a system must include all entities belonging to a real system of concern.

### 3.4.1 Systems in information and computer science

In computer science and information science, **system** is a software system which has components as its structure and observable inter-process communications as its behavior. Again, an example will illustrate: There are systems of counting, as with Roman numerals, and various systems for filing papers, or catalogues, and various library systems, of which the Dewey Decimal System is an example. This still fits with the definition of components which are connected together (in this case in order to facilitate the flow of information). System can also be used referring to a framework, be it software or hardware, designed to allow software programs to run.

### 3.4.2 Systems in engineering and physics

In engineering and physics, a physical system is the portion of the universe that is being studied (of which a thermodynamic system is one major example). Engineering also has the concept of a system that refers to all of the parts and interactions between parts of a complex project. Systems engineering

refers to the branch of engineering that studies how this type of system should be planned, designed, implemented, built, and maintained.

### 3.4.3 Systems in social and cognitive sciences and management research

Social and cognitive sciences recognize systems in human person models and in human societies. They include human brain functions and human mental processes as well as normative ethics systems and social/cultural behavioral patterns.
In management science, operations research and organizational development (OD), human organizations are viewed as **systems** (conceptual systems) of interacting components such as subsystems or system aggregates, which are carriers of numerous complex business processes (organizational behaviors) and organizational structures. Organizational development theorist Peter Senge developed the notion of organizations as systems in his book The Fifth Discipline.
System thinking is a style of thinking/reasoning and problem solving. It starts from the recognition of system properties in a given problem. It can be a leadership competency. Some people can think globally while acting locally. Such people consider the potential consequences of their decisions on other parts of larger systems. This is also a basis of systemic coaching in psychology.

Organizational theorists such as Margaret Wheatley have also described the workings of organizational systems in new metaphoric contexts, such as quantum physics, chaos theory, and the self-organization of systems.

### Pure logical systems

There is also such a thing as a logical system. The most obvious example is the calculus developed simultaneously by Leibniz and Isaac Newton. Another example is George Boole's Boolean operators. Other examples have related specifically to philosophy, biology, or cognitive science. Maslow's Hierarchy of Needs applies psychology to biology by using pure logic. Numerous psychologists, including Carl Jung and Sigmund Freud have developed systems which logically organize psychological domains, such as personalities, motivations, or intellect and desire. Often these domains consist of general categories following a Corollary such as a Theorem. Logic has been applied to categories such as Taxonomy, Ontology, Assessment, and Hierarchies.

### Systems applied to strategic thinking

In 1988, military strategist, John A. Warden III introduced the Five Ring System model in his book, The Air Campaign, contending that any complex system could be broken down into five concentric rings. Each ring Leadership, Processes, Infrastructure, Population and Action Units could be used to isolate key elements of any system that needed change. The model was used effectively by Air Force planners in the First Gulf War. In the late 1990s, Warden applied his model to business strategy.

## 4.0 Conclusion

The term "system" comes from the Latin word systēma, it mean the "whole compounded of several parts or members, system", literary "composition". A system comprises multiple views. Man-made systems may have such views as concept, analysis, design, implementation, deployment, structure, behavior, input data, and output data views.

## 5.0 SUMMARY

In this unit you have learnt, System concepts, Subsystem, Analysis of systems and Application of the system concept.

## 6.0 **TUTOR-MARKED ASSIGNMENT**

1) What are the Applications of the system concept

11) Explain the difference between close and open system.

7.0 **References**

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**UNIT 15: SYSTEM CLASSIFICATION**

**CONTENTS**



## 1.0 Introduction

The previous unit considers, A system is a set of interacting or interdependent component parts forming a complex or intricate whole. Every system is delineated by its spatial and temporal boundaries, surrounded and influenced by its environment, described by its structure and purpose and expressed in its functioning.
Information systems have become the backbone of most organizations. Banks could not process payments, governments could not collect taxes, hospitals could not treat patients, and supermarkets could not stock their shelves without the support of information systems. In almost every sector education, finance, government, health care, manufacturing, and businesses large and small information systems play a prominent role. Every day work, communication, information gathering, and decision making all rely on information technology (IT).

## 2.0 Objectives

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

- Explain the term Control System and
- Other System

## 3.0 Main Content

### 3.1 Control System

All our tools and machines need appropriate control to work, otherwise it will be difficult to finish their designated tasks accurately. Therefore, we need control systems to guide, instruct and regulate our tools and machines. Common control systems include mechanical, electronic, pneumatic and computer aided. A system usually contains three main parts: input, process and output.

### 3.1.1 Mechanical system

**A mechanical system is a device made up of various mechanical parts. Its input is provided by an effort. Once the effort and is applied, it can set off a motion to move a load. The force applied to the load is the output of the mechanical system. Examples of mechanical systems include levers, gears and shafts. Fig. 1 shows some examples of mechanical systems.**

Fig. 1 Examples of mechanical systems

**(a) Can opener** **(b) Corkscrew**

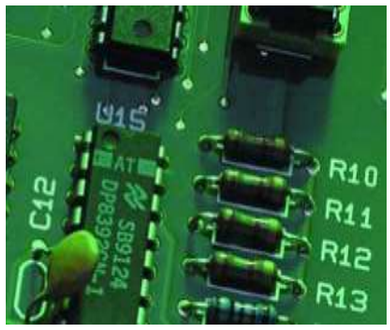



Fig. 3 Electronic circuit board

### 3.1.2 Electronic system

An electronic system is a system that employs electronic signals to control devices, such as radios, calculators, video game machines, mobile phones, portable computers, etc (Fig. 2). The input of an electronic system is provided by electronic signals. After they are processed, they can generate output signals, which control the operation of various devices, such as amplifiers and LCD. Electronic systems can carry out many different tasks, such as generating sound, transmitting information, displaying video, measuring, memorising, calculating, etc. Common examples of electronic devices include semi-conducting diode, transistors, capacitors that they are usually welded onto electronic circuit boards (Fig. 3).

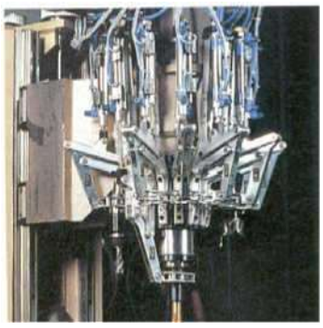
(a) Mobile phone (b) Portable computer Fig. 2 Examples of electronic systems

### 3.1.3 Computer control system

A computer control system uses a computer to control its output devices according to different input signals. Its function is similar to that of an electronic system. Yet a computer control system can use high speed calculation to process large volume of input signals within a very short time, and then generates appropriate outputs with the help of preset programs. Examples of computer control systems include computer numerical control press brakes, computer controlled home appliances, computer controlled underground railway systems, etc (Fig. 4).

Fig. 4 Examples of computer control systems

(b) A proposed computer controlled



(b) **Mechanical clamp**

home appliances

### 7.1 Pneumatic system

A pneumatic system is a system that uses compressed air to transport and control energy. Air is first pressurized to give energy in the cylinder. Then signals are input into the system through the use of switches. Next, air is transferred through sealed pipes to the pneumatic parts for processing. Finally, the force produced by the pneumatic parts is utilized to finish the designated task. The use of pneumatic systems is very extensive, for example, in controlling the movement of train doors, the operation of automatic production lines and mechanical clamps, etc (Fig.5).

(a) Production line of CD-ROM Fig. 5 Examples of pneumatic systems

3.2 Other systems

There exist many other control systems apart from the ones mentioned above, for example, mail processing systems, commercial operation systems, etc. The input, process and output of different systems have different properties. In this chapter, we will discuss some of the most common control systems.

### 3.2.1 Total Analysis System

(TAS) describes a device that automates and includes all necessary steps for chemical analysis of a sample e.g. sampling, sample transport, filtration, dilution, chemical reactions, separation and detection. A new trend today is creating Micro Total Analysis Systems - **µTAS.** Such a system shall shrink a whole laboratory to chip-size lab-on-a-chip. Because of its very small size, such a system can be placed close to a sampling site. It also can be very cost effective thinking of chip technologies, sample sizes and analysis time.

### 3.2.2 Sub-systems

A system can be very simple, for example, a switch is only needed in controlling a light bulb to work. However, with the advancement of technology, most of the control systems gradually become complicated that various parts are involved. Take a lift as an example. It needs a number of parts to be cooperative in operation, so as to transport passengers to different storeys safely and rapidly (Fig. 6). A system may comprise some relatively small parts. They are known as sub-systems. For instance, a lift

Fig. 6 (a) A sightseeing lift in a shopping arcade

(b) A lift in a hospital

system includes driving system, door opening system, control system, safety system, lighting system, ventilation system and security system (Fig. 7). Fig. 8 shows a diagram to illustrate those sub-systems in a lift.

In fact, each sub-system can be considered as an independent system that includes input, process and output. While there exist relationships between the sub-systems that an output of one sub-system may become the input of another. Take the lift as an example. The output generated from the control system may affect the driving and door opening systems (Fig. 9). However, attention should be paid in the complexity of relationships of some sub-systems.

**Fig. 9 Relationships between sub-systems**

Therefore, when analyzing a complicated control system, that system can be divided into several comparatively simple sub-systems so as to familiar with the operation of the whole system easily. Besides, based on the sub-system concept, we could understand the relationships of the parts of the whole system much easier.

3.3.2 Different types of control systems

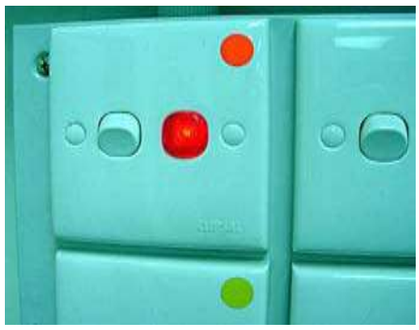
Open loop and closed loop control systems

There are basically two types of control system: the open loop system and the closed loop system. They can both be represented by block diagrams. A block diagram uses blocks to represent processes, while arrows are used to connect different input, process and output parts.

(i) Open loop control system


Fig. **10 Block diagram of an open loop control system**

Fig. 10 shows a simple open loop control system. Its operation is very simple, when an input signal directs the control element to respond, an output will be produced. Examples of the open loop control systems include washing machines, light switches, gas ovens, etc.



(b) light switches

(a) Washing machine

**(b)** Fig. 11 Examples of open loop control system

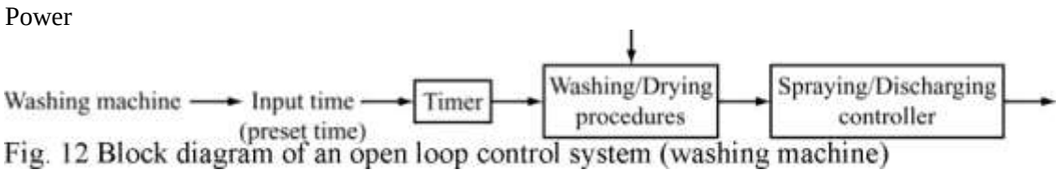



Fig. 12 Block diagram of an open loop control system (washing machine)

**(c)** A washing machine is an example of an open loop control system. Fig. 12 shows its block diagram. The input and output of an open loop system are unrelated. An example is that the operation of a washing machine does not depend on the cleanness of the clothes, but rather on the preset time. Both the structure and the control process of an open loop control system are very simple, but the result of the output depends on whether the input signal is appropriate or not.

More sophisticated example of an open loop control system is the burglar alarm system (Fig. 13). The function of the sensor is to collect data regarding the concerned house. When the electronic sensor is triggered off (for example, by the entry of an unauthorized person), it will send a signal to the receiver. The receiver will then activate the alarm, which will in turn generate an alarm signal. The alarm signal will not cease until the alarm is stopped manually.

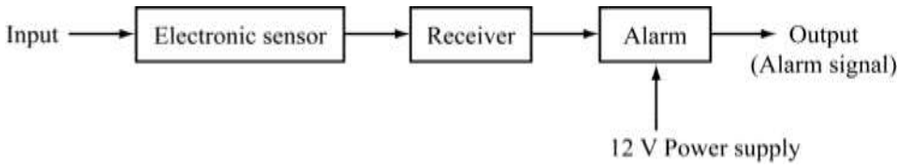
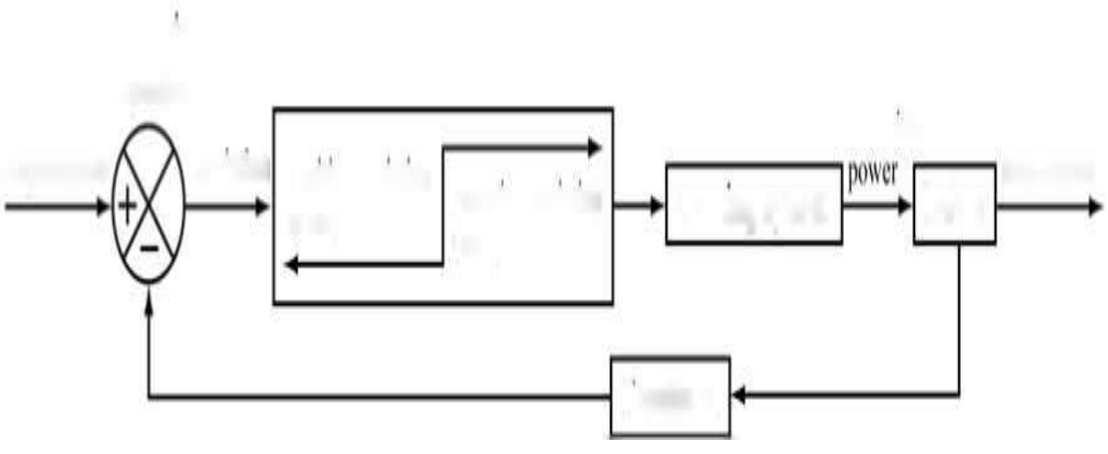



Fig. 13 **Block diagram of an open loop control system (burglar alarm)**

The drawback of an open loop control system is that it is incapable of making automatic adjustments. Even when the magnitude of the output is too big or too small, the system will not make the appropriate adjustments. For this reason, an open loop control system is not suitable for use as a complex control system. Sometimes it may even require monitoring and response from the user. For example, when a washing machine finishes cleaning the clothes, the user will need to check whether the clothes are clean or not; if they are not, they have to be put back into the machine and washed again.

(ii**) Closed loop control system**



Sometimes, we may use the output of the control system to adjust the input signal. This is called feedback. Feedback is a special feature of a closed loop control system. A closed loop control system compares the output with the expected result or command status, then it takes appropriate control actions to adjust the input signal. Therefore, a closed loop system is always equipped with a sensor, which is used to monitor the output and compare it with the expected result.

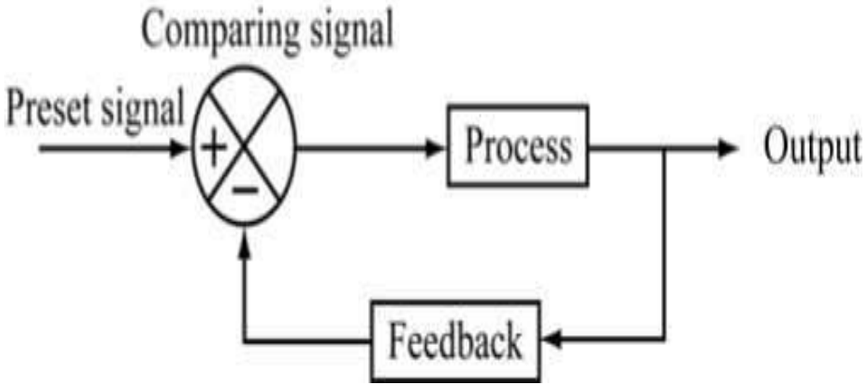



**Fig. 14 Block diagram of a closed loop control system**

Fig. 14 shows a simple closed loop system. The output signal is fed back to the input to produce a new output. A well-designed feedback system can often increase the accuracy of the output. Feedback can be divided into positive feedback and negative feedback. Positive feedback causes the new output to deviate from the present command status. For example, an amplifier is put next to a microphone, so the input volume will keep increasing, resulting in a very high output volume. Negative feedback directs the new output towards the present command status, so as to allow more sophisticated control. For example, a driver has to steer continuously to keep his car on the right track. Most modern appliances and machinery are equipped with closed loop control systems. Examples include air conditioners, refrigerators, automatic rice cookers, automatic ticketing machines, etc. An air conditioner, for example, uses a thermostat to detect the temperature and control the operation of its electrical parts to keep the room temperature at a preset constant.

Fig. 15 shows the block diagram of the control system of an air conditioner.

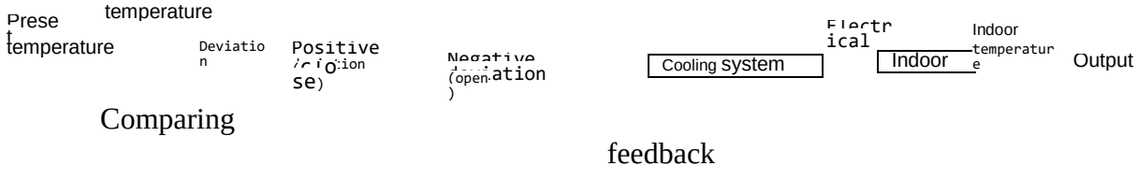


Fig. 15 Block diagram of the control system of an air conditioner

One advantage of using the closed loop control system is that it is able to adjust its output automatically by feeding the output signal back to the input. When the load changes, the error signals generated by the system will adjust the output. However, closed loop control systems are generally more complicated and thus more expensive to make.

**4.0 Conclusion**

Every system is delineated by its spatial and temporal boundaries, surrounded and influenced by its environment, described by its structure and purpose and expressed in its functioning. **Common control systems include mechanical, electronic, pneumatic and computer aided.**

5**.0 Summary**

In this unit, we have explained the **Common control systems include mechanical, electronic, pneumatic and computer aided system**. Other systems which includes Total Analysis System, Sub-systems the Open loop and closed loop control systems as types of control.

**6.0 Tutor Marked Assignment**

Q1 Explain the **mechanical, electronic, pneumatic and computer aided system**
Q2. What is Total Analysis System?
Q3. Describe the differences Open loop and closed loop control systems?

**7.0 References/Further Readings**

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## UNIT 16: FILE PROCESSING

MAIN CONTENT
1.0 Introduction
2.0 Objectives
3.0 Main Content
    3.1 Working with Files
    3.2 Working with Sequential Files
    3.3 Working with Random Files
4.0 Conclusion
5.0 Summary
6.0 Tutor Marked Assignment
7.0 References/Further Readings

### 1.0 Introduction

A data file is a named collection of related records normally kept in external storage. Data stored in files are permanent until you decide to delete them. Data files once they have been created can be used as input for the same program for as many program run as you want without having to retype data. Data files facilitate the sharing of data by many applications. Each record is broken down into fields. For example, in the Student registration file, information on Matriculation Number, Name, School, Department, and Level, make up a record.

| **Matriculation Number** | **Name** | **School** | **Department** | **Level** |
|---|---|---|---|---|
| | | | | |
| | | | | |

Table 1: Students record

### 2.0 Objectives

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

- Explain why data are stored in files
- Use various VB statements to implement file processing
- Provide sample codes in VB to demonstrate file processing

### 3.0 Main Content

### 3.1 Working with Files

This refers to the manner in which data are organized, stored and retrieved. Two major ways of file organization are sequential and random
The three main steps used for processing files are as follow:

1. Open the file: A file must be open for data to be read or written to it.
2. Read or Write records to a file
3. Close the file

**i.** ) The Open Statement

The Open statement makes a file ready for use. The syntax of the Open statement is

Open Filename For mode As #File number [Len = Record length]

- Filename is the name of the file to be open and may include the drive and the path if not in the current directory
- The mode is used to indicate the way that the file is accessed and could be INPUT, OUTPUT, APPEND or RANDOM

| **File Mode** | **Description** |
|---|---|
| Input | This is used to read already stored in a disk |
| Output | Used when data are output from a program and written on the disk, new data are written at the beginning of the file, overwriting any existing data. |
| Append | Used when data are to be added to the end of an existing file. |
| Random | Allows input and output data and records to be accessed in any order. |

Table 2: File Mode.

- File number is a number associated with the opened file. It value can be from 1 to 511.
- The Record length is the number of characters in a record and can be up to 32,767 characters. This is usually associated with Random files.

Examples of O pen Statement

Open Studrec.dat For Input As #1

This opens a file named Studrecas an Input file in the current directory calling it file #1

Open A:\library.dat For Output As #2

This opens a file named library.dat as an Output file in drive A calling it file #2

**Open A:\Inventory.dat For Random As #3 len = 30**

This opens a file named Inventory.dat as a Random file in drive A calling it file #3 with record length of 30.

### ii. Close Statement

The close statement is used to close the opened file(s) and terminates the processing of a disk file. The syntax of the close statement is Close #File number

File number is the number associated with file opened.

Examples

**a)** Close #1
This closes file #!

**b)** Close #1, #2, #3

This Closes file #!, #2 and #3

**c)** Close

This closes all opened files

### iii. Using Free File Function

For a small project it may be easy for you to assign file number 1, 2 3 as so on to your files as they occur without conflict. However, for large projects this ma y not be feasible in which case you can use the Free file function to assign the next available file number to your file as they occur.

Sequential files contains data elements stored one after the other according to a particular order. Data are read from a sequential device in the same sequence that they were written. To locate a record in a sequential file you must start from the beginning, and move from one record to the other until the record is found or you get to the end of the file.

**i.** ) Reading Data in a Sequential File
To read data in a sequential file, the file must be opened first in a Input mode.
Then use the input statement. The Syntax for the Input Statement is:

Input #File number, list of fields

Example

Input #1, lbl Matric no. Caption, lbl Name. Caption, lbl School. Caption, lblDepartment. Caption, lblLevel. Caption Input #2, intScore1, intScore2, int Total score

**ii.** ) The EOF Statement
This statement is used to mark the end of file. The general Syntax is:
EOF (file number)

**iii.** ) Writing Data to a Sequential File
Before data can be placed in a sequential file it must be opened first in either Output or Append mode. The write statement is used to place data in a sequential file. The general syntax of the Write statement is Write #File number, list of fields

Examples

Write #1, txtMatricno. Text, txtName. Text, txtSchool. Text, txt Department. Text, txtLevel. Text Write #2, intScore1; intScore2; int Total score.

### 3.3 Working with Random Files

Random files allow data to be read in any order unlike a sequential file. Random files allow data to be accessed directly without starting from the beginning and moving from one record to the other until the data is found or one gets to the end of the file.Before a record can be used as a random file you need to set up its structure with a Type statement and then dimension a record variable of the data type. The following code uses the Type statement to declare Student record type:

```
Private Type Student
   Matricnum As String * 12 Name As String *20 School As String * 20 Dept As String * 20 Level As Integer
```

End Type

To access a custom record type use the dot notation. This is similar to accessing object properties

```
Dim Stud1 As Student
Stud1.Matricnum = NOU050010456 Stud1.Name = Sonekan Tunde
Stud1.School = Social Sciences Stud1.Dept= Accounting Stud1.Level =400
```

**i.** Reading and Writing a Random file

The Put and Get statement are used to access random files.

**ii.** Using the P ut Statement
The put statement is used to add or store record into a random file. The syntax of the put statement is as follow

Put filenumber, [recnumber], listoffields.
Put #2, intScore1, intScore2
Examples

**iii.** Using the Get Statement
The get statement is used to retrieve record from a random file. The syntax of the get statement is as follow

Get file number, [rec number], list of fields.

Examples
Get #1, intScore1, intScore2, int Total score
**iv.** Using the Seek statement
The seek statement is used to move from record to record. The seek statement has two parameters which are the file number and the record number.

Example Seek #1, 5

This causes the next Put or Get to access record number 5.

## 4. Conclusion

One of the features of a computer that makes it suitable for data processing is its ability to store data either temporarily or permanently. Data files are used to store information more permanently in secondary storage devices. Data files once they have been created can be used as input for the same

program for as many program run as you want without having to retype data. Data files are very essential for data processing.

## 5. Summary

Data processing applications such as inventory, payroll, accounting, budgeting, and students information systems require that data are stored permanently in a file. In this unit we explained the meaning of a file and covered how Visual Basic language is used to implement the processing of files.

## 6. Tutor Marked Assignments

Q1. What are the differences between a sequential file and a random file?
Q2. What is the purpose of the EOF statement?

## 7. References/Further Readings

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**MODULE 4;**

**UNIT 17: IT ARCHITECTS AND IT'S INFRASTRUCTURE**

**UNIT 18: ELECTRONIC COMMERCE**

**UNIT 19: E-COMMERCE MERITS, DEMERITS AND TECHNOLOGICAL CHANGES**

**UNIT 20: GUIDELINES FOR INFORMATION AND COMMUNICATION TECHNOLOGY IN NIGERIA**

**UNIT 21: GLOBALIZATION/INTERNATIONAL INSTITUTIONS**

## UNIT 17: IT ARCHITECTS AND IT INFRASTRUCTURE

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### 1.0 Introduction

**I**T architects work for companies and organizations to maintain computer networks. They typically need to have a bachelor's degree in order to gain employment, though some employers prefer those with a master's degree or certification. While IT infrastructure is the composite hardware, software, network resources and services required for the existence, operation and management of an enterprise IT environment.

### 2.0 Objectives

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

- Explain meaning and job description of **I**T architects
- Discuss the IT Infrastructure and it various components

## 3.0 Main Content

IT architects create and maintain computer networks for organizations, companies and other users. A Bachelor's Degree in Information Systems or a related field is required for this position, though employers may give preference to applicants who have completed graduate education in an area related to information systems management. IT architects may also pursue voluntary certification to bolster their credentials.

### 3.1 **Job Duties of an IT Architect**

The primary duties of an IT architect are to design and maintain computer networks. Architects use computer design software to model and test network plans prior to implementation. Additionally, they may use these programs to simulate adding new hubs, changing routers or making other modifications to existing networks.

IT architects may act as managers and are responsible for scheduling technician assignments and assessing budgetary needs, which may include estimating upgrade costs or switching Internet services. Other duties may include conducting computer support personnel evaluations and coordinating future direction on technical issues, such as obsolete software.

#### 3.1.1 Job Requirements of an IT Architect

Preparing for a career as an IT architect begins with completing a bachelor's degree program in information systems or a related field. Freshman and sophomore students begin with introductory classes, such as knowledge organization, database creation and operating system basics. Students who have progressed in the major may delve more deeply into intermediate and advanced topics including management support systems, network security and system design. Most programs also offer students the option of conducting a research project in which they apply learned knowledge with approved research in order to analyze risk management techniques, system design assumptions or other information science issues.

#### Advanced Degrees

The BLS stated that employers may favor candidates who have completed a master's degree in business administration (MBA) with a concentration in management information systems or a related area. MBA programs typically combine managerial and technical topics, like using databases to enhance e-commerce and coordinating operation systems with wireless networks. Students generally complete these programs in 1-2 years and have the option of taking supplemental computer programming classes in C++ or Java.

#### Certifications

IT architects may consider attaining voluntary certifications in order to advance employment prospects. Industry-neutral certifications like those offered by the Computing Technology Industry Association, Project Management Institute or the Security Certified Program demonstrate to an employer that an applicant has completed the necessary training and developed the required skills to perform the job. Candidates may also consider vendor certifications offered by companies like Microsoft and Cisco Systems, which train IT professionals in operating systems, servers, routers and other products.

Earning a credential generally requires completing one or more courses and a certification exam. Credentialing organizations may mandate that candidates take continuing education courses to become recertified. Interested candidates may want to consult the respective credentialing organization for specific details.

There are a number of voluntary certifications available for IT architects. These are offered by industry associations or specific vendors. Employment for IT architects is expected to grow faster than average for the 2014-2024 decade, according to the BLS.

## 3.2 IT Infrastructure

### Definition

IT infrastructure refers to the composite hardware, software, network resources and services required for the existence, operation and management of an enterprise IT environment. It allows an organization to deliver IT solutions and services to its employees, partners and/or customers and is usually internal to an organization and deployed within owned facilities**.**

### 3.2.1 IT infrastructure Components

IT infrastructure consists of all components that somehow play a role in overall IT and IT-enabled operations. It can be used for internal business operations or developing customer IT or business solutions.
Typically, a standard IT infrastructure consists of the following components:

- Hardware: Servers, computers, data centers, switches, hubs and routers, etc.
- Software: Enterprise resource planning (ERP), customer relationship management (CRM), productivity applications and more
- Network: Network enablement, internet connectivity, firewall and security
- Meat ware: Human users, such as network administrators (NA), developers, designers and generic end users with access to any IT appliance or service are also part of an IT infrastructure, specifically with the advent of user-centric IT service development.

## 4.0 Conclusion

**I**T architects work for companies and organizations to maintain computer networks. IT infrastructure is the composite hardware, software, network resources and services required for the existence, operation and management of an enterprise IT environment.

## 5.0 Summary

This unit has provided you detail information on IT architects, job description relevant requirements. IT Infrastructure and it various components.

**6.0 Tutor Marked Assignment**

- Q1 Explain Job Requirements and Duties of an IT Architect**.**
- Q2. What are the IT infrastructures Components?

**7.0References**

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## UNIT 18: ELECTRONIC COMMERCE

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### 1.0 Introduction

The development of satellites and telecommunications allow communication on large scale, having a reduced cost. This continual improvement of the communication forms drew the possibility to increase the efficiency to use the computers for communication too. The connection between telecommunications and computers made possible the explosive growth of the Internet and we assist at the creation of specific technologies, especially in the field of the pay security systems, which they will transform into an usual trade instrument.

### 2.0 Objectives

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

- Explain in clear terms the meaning of E-Commerce
- Discuss the types of E-Commerce and
- Identify the advantages and disadvantages of E-Commerce

### 3.0 Main Content

Electronic commerce better known as e-commerce consists of the buying or selling of products via electronic means such as the internet or other electronic services. This type of trade has been growing rapidly because of the expansion of the Internet.

### 3.1 History of E-Commerce

The need for electronic commerce emerged from the need to use computers more efficiently in banks and corporations. With the increasing competition there was a need amongst organizations to increase customer satisfaction and information exchange. Electronic commerce started with the introduction of electronic funds transfer (EFT) by banks. Over time many variants of EFTs within banks were introduced like debit cards, credit cards and direct deposits.

### 3.2 Types of E-commerce

There are 5 common types of E-commerce:

1. Consumer to business E-commerce
2. Business to business E-commerce
3. Business to consumer E-commerce
4. Consumer to consumer E-commerce
5. Intra organizational E-commerce

### 3.3 Advantages of E-commerce

- It can help increase profits; it can increase sales and decrease costs.
- It can help organizations do business 7 days a week and 24 hours a day.
- It can help organizations have customers all around the globe and not be limited to a specific region.
- It helps organizations bring higher return on advertisements, if managed properly.
- It helps organizations identify new suppliers, partners and customers.
- It increases flexibility and ease of shopping for the customer.
- It can help in low operational cost.
- It can provide personalized product and customer customization.
- Shoppers are given a broader range of products to choose from online.

### 3.4 Disadvantages of E-commerce

- The buyer cannot touch or feel the product online.
- The customer has to wait for delivery of their product.
- Perishable goods bought online can get spoiled during delivery.
- It is difficult to know when an online site is safe to use.

### 4.0 Conclusion

Electronic commerce started with the introduction of electronic funds transfer (EFT) by banks. Over time many variants of EFTs within banks were introduced like debit cards, credit cards and direct deposits.

The disadvantages are not impossible to avoid. If we have enough management on risks, we may really get a lot more advantages from e-commerce. The advantages are surely teasing, and we will enjoy such easy transaction these days. Enjoy more your internet browsing and enjoy more your e-commerce activities.

## 5.0 Summary

This unit has provided you detail information on the history of e-commerce, the relevant types of e-commerce as well as advantages and disadvantages accompany. We shall proceed to consider Technological changes, merits, Demerits of e-commerce to economic agents in the next units.

6.0Tutor Marked Assignment
Q1 Account for the brief history of **electronic commerce.**
Q2. What are the advantages and disadvantages of e-commerce?

## 7.0References

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**Unit 19: E-Commerce Merits, Demerits and Technological Changes**

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## 1.0 Introduction

There is no doubt that internet has an extraordinary impact on the business world. This is because of the obvious advantages for both traders and buyers in comparison with the carrying out traditional means of the commercial activities. In spite of these the internet has also disadvantages that are different depending on the involved party, the security of the transactions or confidentiality loss possibility.

The third millennium makes us the witnesses of the development of the electronic trade which revolutionize the management of a business and the international trade. The first impact is already experienced in the transactions between firms, not because they would have an easier access at the new technology, but because the phenomenon will be felt soon by the consumers too. Such changes will offer the consumers new possibilities to choose and even to look for the most competitive products on the world's market.

## 2.0 Objectives

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

- Explain the term technological change
- Discuss Electronic commerce and
- Electronic Commerce Advantages and Disadvantages to economic agents.

## 3.0 Main Content

**3.1 Technological change** may be the most important source of entrepreneurial opportunities. While the accurate dating of the arrival of major technological innovations is difficult, it is reasonable to say that the genesis of our information society was in the mid to late 1950s and early 1960s. Transatlantic cable telephone service began. The Soviet Union launched Sputnik, suggesting the possibility of global satellite communications. Transistors replaced vacuum tubes in computers. Compilers opened the door to higher-level programming languages, and the development of the computer "chip" was under way.

Perhaps the most important invention in shuttling us from an industrial society to an information society was the computer chip. Such chips are the backbone of all modern computing and enable the

telecommunications applications and information systems that have changed the way almost everyone lives. The worldwide distribution of computer chips (and the software systems running on them) has paved the way for what may be the most significant innovation in global commerce since the merchant ship: the Internet. The Internet is an incredibly diffuse collection of computers networked together. It is hard to think of anything else in history that parallels the level of international coordination (individuals and entities) that the Internet has almost painlessly achieved, and in a remarkably short time. When the Internet's ability to provide nearly instant worldwide communication was combined with rapid transfer of graphic images, the Internet became the infrastructure for the "World Wide Web," a user-friendly and commercially attractive foundation for many new ways of doing business, including retail and wholesale operations through electronic commerce. In addition to the Web's commercial applications, the Internet has dramatically changed the way almost everyone goes about daily business.

**3.2 Electronic commerce, or e-commerce,** involves the use of electronic means to conduct business online. Although many of the simple "dot.com" and "e-commerce" business models of the late 1990s did not work, the Internet economy and e-commerce are here to stay. Simply put, we will never do business the same way we did before the Internet. It has become too easy to compare various suppliers' prices or check on the latest offer from our competitors to return to conducting business in the "darkness" tolerated only a few years ago. A simple example is online package tracking. Now, instead of using the phone to say a package is "in the mail," the sender is expected to provide a tracking number to be used on the Web so that the sender and the receiver can ascertain the veracity of this claim and follow the package along its route.

### 3.2.1 Electronic Commerce Advantages for traders

**The possibility of the small companies to compete with the large companies**
Due to small expenses incurred by a virtual shop small companies are confronting with one less barrier in penetrating the markets already dominated by the large companies. More than this due to her flexibility and perception towards new the small company has a major advantage in comparison with a large one dominated by birocracy and conservatorism.

**Permanent contact with customers for 24 hours and 7 days**
Comparing with the common employees who need salaries, a working time table, vacation, with a varying productivity and being subjective a web site is offering information about the company and her products or she is taking and processing orders for 24 hours of 24 and 7 days of 7 continuously with minim costs. This is bringing an advantage, too in case of the expansion on the foreign markets when the hourly difference making more difficult the contacts between the companies. It also improves the communication with the customers that have not to observe a strict time table thus being able to obtain information and place orders any time.

**International markets penetration facilities**
The world network is not limited by borders, it does not belong to anyone and the access and publication costs are extremely low. The communication with a customer positioned to the opposite pole of the world is as easy as the communication with someone in the next room. Any producer now

can sell his products in any country by the means of the web site and no contacts with local companies or large investments are necessary anymore.

**The decrease of the functioning costs**
These costs may be drastically diminished by the automatics of the orders process. There is also the possibility of a total automatics by the integration with the administration system thus leading to the increase of the general productivity of the company.

**New possibilities for performing a direct marketing (one-to-one)**

Comparing with a human being the computer may retain not only the name and personal data of all customers as well as their preferences being capable to adapt the offer and products presentation according to each customer's profile. The study of the customers on internet may be achieved using all available data such as: location, type of browser and operation system, the site where they do come from navigation habits but the customers will not realize at all that they are subject of such studies. This is why many consider this as an infringement of the personal intimacy.

### 3.2.2 Electronic Commerce Advantages for buyers

**Availability for 24 hours of 24 and 7 days of 7**
This availability independent on a certain program represents a major advantage for the clients who can purchase during night too when they are not busy with other urgent problems (job, household).

**Facilities**
Due to the electronic commerce there is no need to go to the commercial places or to the shop next to corner .Everybody may place orders from home sitting in front of the PC and thoroughly analyzing and comparing different products.

**Access to information and different products without any restrictions**
The apparition of the electronic commerce gave a new meaning of the term 'globalization'. For example in order to buy handcrafted items from Madagascar it is not necessary to travel to that destination but only to open the browser at the address of a shop that is trading such items (address that can be found using the searching motors). Before buying the product the potential future buyer has more free and cheap access to the offers of the producers or trading companies.

### 3.2.3 Electronic Commerce Disadvantages for buyers

**Security**
The most important reason for which some persons hesitate to use internet for purchases-as resulted from most of the opinion polls – is that of being afraid to supply on line information regarding the credit card. But the same persons are giving daily the credit card number, at phone, to other persons they even do not know at all when they buy from catalogues or TVs.

**Intimacy**

Another important problem is the attempt to the personal intimacy. The potential buyers are afraid that by internet the traders or a bad will person can collect thorough information and they will not realize this at all. Unfortunately these worries are the result of some exaggerations especially in Occident where The Theory of Conspiracies is fashionable.

**Absence of human contact**

This is the obvious inconvenient generated by the electronic commerce. The low launching and maintenance costs of a virtual shop derives of the advantages of the automatics of the processes and there is no need to employ additional personal, on one hand. On the other hand the absence of the seller, the human presence to which the buyer may appeal to in case he has doubts, represents an obstacle in spreading this form of commerce. In this respect some companies created programs that are permitting the vocal contact or visual one between the customer and one employee of the company during his visit on the web site.

### 3.2.4 Electronic Commerce Disadvantages for traders

**The Fraud**

As in any other activity field, the technology of internet created new fraudulent possibilities. In the lack of a direct contact a client may cheat the trader regarding his identity or his real payment possibilities. Most of the occidental virtual shops hesitate to send commodities to East Europe because of the many successful embezzlement trials initiated by East Europeans with false credit cards.

**The Security**

Another important problem is that regarding the security of the data. A company that has not access to internet does not have too many worry reasons as regards the integrity of her administration informatics systems. The connection to a public network that can be accessed by anyone more or less authorized and the access to the confidential data of the local network is raising serious problems. Therefore new risks occur these being not present before the apparition of such type of commerce.

**Launch and integration costs**

Although the launch costs of a virtual shop are much lower in comparison with those of a real one they may be incorrectly estimated. A company that has not implemented yet an administration informatics system or those where the employees do not have minim technical knowledge may confront with an unexpected increase of the launch costs due to the necessity of the acquisition of training systems for the employees.

## 4.0 Conclusion

Internet functionality affects modern life in almost uncountable ways, including such common things as electronic mail (e-mail), remote access, large file transfer (including pictures, music, and videos), instant messaging, and, more recently, cell phone–Web cross-functionality. E-commerce involves the use of electronic means to conduct business online.

## 5.0 Summary

This unit has provided you detail information on the history of e-commerce, the relevant types of e-commerce as well as advantages and disadvantages accompany. We shall proceed to consider Technological changes, merits, Demerits of e-commerce to economic agents in the next units.

6.0Tutor Marked Assignment
Q1 Account for the advantages and disadvantages **electronic commerce to economic agents.**
Q2. What did you understand by technological changes?

**7.0**References
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## UNIT 20: GUIDELINES INFORMATION AND COMMUNICATION TECHNOLOGY IN NIGERIA

Table of Contents



1.0 Introduction

To counteract security fears, we need innovative and technical solutions to enable systems to be managed - to mitigate risk. These systems will get even more complex in the future, so there is an element of the unknown. We need expertise today to start predicting future security problems. We need to start taking a prevention approach, not cure.
In exercise of the powers conferred on it by section 6 of the National Information Technology Development Agency Act of 2007, NITDA (under the auspices of the Federal Ministry of Communication Technology) hereby issues the following guidelines on Nigerian. Content Development in Information and Communication Technology. NITDA shall exercise the power to institute a sustainable implementation framework for the guidelines.

**2.0 Objectives**

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

- Explain the purpose & objectives guidelines on Nigerian Content Development in Information and Communication Technology.
- Understand the Enforcement of guidelines on Nigerian Content Development in Information and Communication Technology and
- Understand Summary of Guidelines for Nigerian Content Development in ICT.

**3.0 Main Content**

**3.1 PURPOSE & OBJECTIVES**

These guidelines are issued for the purpose of achieving the following National objectives**:**

I. Enable the local ICT industry to contribute meaningfully towards the achievement of national development targets

II. Stimulate and increase the production, sales and consumption of high quality information technology products and services developed by indigenous companies that serve the unique needs of the local and global market
III. Enable indigenous information technology companies and provide them opportunities that will improve their ability to provide relevant products and services that amply satisfy the Nigerian consumer.

IV. Facilitate efforts to build capacity and equip Nigerians to serve as active workers and participants in the local ICT industry
V. Provide a framework for the regulation and legislation on the creation, distribution and use of Information Technology and its associations within Nigeria
VI. Promote and encourage an environment within Nigeria that is welcoming to foreign investments in Information and Communication Technology, as well as the export of indigenously made ICT goods and services.

**3.2 Enforcement**
The enforcement of these guidelines shall be by NITDA and the relevant authorities in both the private and public sectors, including Federal, State, and Local bodies in charge of ICT procurement, regulation, and development under a framework to be developed by NITDA.

**3.3 Summary of Guidelines for Nigerian Content Development in ICT**

1. The purpose of this summary is to make it easier for professionals within the ICT sector to understand the Local Content guidelines put forward by NITDA which came into effect on December 3, 2013 by highlighting key details of the guidelines and how they affect each type of company operating within the sector. The Local Guidelines were created in collaboration with a wide range of stakeholders (include the stakeholders), taking into account best practices as well as realities on ground within the IT Sector in Nigeria, and aimed at creating success for all parties within the Nigerian IT sector. Nigeria has seen a lot of growth in the use and adoption of digital technology for communication and computing. In the 10 years between 2001 and 2011, tele density increased from 0.73% to 70%. There was also growth in the number of homes with computers and internet access as the number of PCs shipped into the country quadrupled. Even with all of this growth, there is still a deficit in economic value generated locally because of the non-existence of technology exports and very low level patronage of locally produced ICT products including hardware and software. There has been growth within the industry, with increasing participation of local companies in services such as OEM Manufacturing, backhaul network provision, submarine and terrestrial cabling etc. These efforts are believed not to be enough, which has led to attempts to improve the ability of local companies to innovate and participate in the industry more effectively. These attempts include provision of venture capital, establishment of business incubators & scholarships for students in ICT related fields. For these reasons, NITDA created these policy guidelines for the sector and are empowered to enforce them in both the public (Federal, State and Local Bodies in charge of ICT Procurement, Regulation and Development) and private (by partnering with the relevant authorities) sectors under a unified framework developed by NITDA. Focus Areas There are three core focus areas of the guidelines: Indigenous innovation, Development of the Local ICT Industry, and establishment of IP Regulation and

Protection within the industry. These areas have a set strategic goals which have performance measures to measure the achievement of the goals.

These are outlined below as follows:

2. Area Strategic Goal Performance Measures Indigenous innovation Achieve a thriving ICT industry capable of contributing to national development goals

   ● Real economic value contributed by the industry to the Nation's GDP

   ● Number and quality of jobs created within the industry

   ● Innovation & Inventiveness of Nigerians and Nigerian companies measured by the creation of startups, patents and Intellectual property. Development of the Local ICT Industry Lay the foundations for thriving ICT industry that can compete globally

   ● Quality standards among local ICT companies

   ● Self-sufficiency in the value chains of Indigenous companies in terms of indigenous value creation.

   ● Capacity Building efforts in the industry IP Regulation and Protection Support technology transfer, indigenous participation and the survival of local players in the sector

   ● Amount of funding/support available for Indigenous Companies

   ● Amount of Foreign Direct Investment in the industry

   ● Number of Innovation Centers / Centers of Excellence

3. Purpose The Local Content guidelines were designed to

   ● Enable the local ICT companies to contribute towards national development targets.

   ● Enable indigenous companies to create and sell high quality IT products and services which will be consumed by the local and global market.

   ● Build and Equip Nigerians with the capacity to participate actively in the Local ICT Industry

   ● Provide opportunities to indigenous companies that will improve their ability to provide relevant products and services to the Nigerian market

   ● Provide a framework to regulate and legislate the on the creation, use and distribution of Information Technology in Nigeria

● Promote the export of indigenously made ICT goods and services, as well as create an enabling environment for FDI into the ICT Industry. Enforcement & Review These guidelines will be applied to all MDAs (Federal, State and Local Council), Private sector institutions, business enterprises and individuals. And they will be included as part of existing or future requirements for accreditation and license renewal of ICT Companies including OEMs, ODMs, Telco's, ISPs, MNCs, VAS Providers etc, as well as grant of approval for establishment of device manufacturing plants There will be guideline review activities to access its responsiveness to emerging trends in the global ICT Industry, responsiveness to changes within the Local ICT industry and also to review the performance of the guidelines. If the guidelines are breached, NITDA is authorized by the National Information Technology Development Act of 2007 to take action (in exercise of the powers conferred on it by Section 6 of the Act). Definition of Terms

● Computer includes information technology systems, whether networked or not

● MDAs mean all Ministries, Departments and Agencies of government at all three tiers, Federal, State and Local, as well as in all three branches, Executive, Legislative, and Judiciary.

4. ● The Agencymeans NITDA or the National Information Technology Development Agency

● IT means Information Technology, and is used interchangeably with, ICT - Information and Communications Technology which is a combination of 5 equipment and services that enables remote gathering, processing, storage, conveyance and delivery of various forms of information

● A Nigerian company is a firm formed and registered in Nigeria under the Companies and Allied Matters Act 1990 with not less than 51% equity shares owned by Nigerians and which has a domain name on the .ng domain.

● A Multinational Company (MNC) is a firm that is registered in more than one country or that has operations in more than one country.

● Original Equipment Manufacturer (OEM) is a firm that makes functional computer devices from component parts bought from other organizations.

● ccTLD means the country code Top Level Domain which is usually denoted by two letters.

● Original Design Manufacturer (ODM) is a firm that produces hardware, which other companies sell under their own brands.

● Hardware computer companies are firms who assemble, maintain and repair computers and peripheral components.

● Technology Platform companies are firms that enable software developers to develop software applications for the platform by using well defined sets of standards. These include operating systems, Runtime libraries, databases and cloud-based platforms.

● Independent Software Vendor (ISV) is any individual or firm that makes and sells software products that run on one or more computer hardware or operating system platforms.

● Software Development Firm (SDF) is a firm that consists of at least five active developers with competencies across popular technologies and platforms - developing, testing and managing software solutions.

● Internet service provider (ISP) is a firm that offers users access to the Internet and related services.

● A Systems integrator (SI) is an individual or business that builds computing systems for clients by combining hardware and software products from multiple vendors.

● A professional service firm (PSF) is any firm with high knowledge intensity and a professionalized workforce providing IT consulting or system integration services.

5. ● Back end / Back office: is the systems that process data, applications or workflow points that do not have direct contact with customers or users.

● Basic raw materials include intermediate products which have undergone the first stage of refinement from their naturally occurring state e.g. silicon ingots

● A Call Center includes an office in an organization or outsourced to third parties where customers service representatives answer subscriber calls for order processing, billing enquiries, fault reporting and general inquiries

● A Completely Knocked Down (CKD) assembly plant is involved in the reassembly of foreign made ICT products that have been imported in the form of basic component parts, with virtually no value added except for labour involved in fitting the parts together and testing

● Firmware is a software that is already transformed into hardware such that it cannot be modified and performs only predetermined functions of a repetitive nature

● Local manufacturing is the ability to design and fabricate a product that meets a specified performance requirement through the use of at least 50% local content by value.

● Manufacturing is the production of simple products or goods that meet specified performance criteria in commercial quantities through the chemical and mechanical transformation of basic or intermediate raw materials

● Middleware is software that allows several other software systems to work together easily.

● Malware is software that is intended to disrupt, damage or cause other software to malfunction or gain an unauthorized access into third party information.

● Nigerian content or local content is the equivalent of local value added to the development, design, fabrication and assembling of ICT products in Nigeria measured in monetary terms as a proportion of production cost or the proportion of indigenous manpower involved in the various stages associated with the provision of an ICT service in Nigeria

● Tele density is the number of citizens out of every hundred or percentage of citizens that have personal telephone lines or numbers ● Telco means Telecommunications company – a company that provides telecommunications services such as telephony and data communications

6. ● Value Added Service is additional or enhanced service that increases the value of an existing product or an offered service.

● SIMis Subscriber Identification Module Summary of the Guidelines Summarized below are the Guidelines for Nigerian Content Development in ICT 1. Guidelines for ICT Hardware 2. Guidelines for Indigenous Software Development 3. Guidelines for ICT Service Provisioning 4. Guidelines for Network & Internet Services 5. Guidelines for Data and Information Management 6. Guidelines for Human Capacity Development in ICT Guidelines for ICT Hardware

● OEMs are required to fulfil the following obligations in order to maintain active certification with NITDA (renewable every 4 years); local capacity for production of devices with multiple form factors either directly or through a local ODM, assemble all hardware within Nigeria at fully staffed facilities, hold ISO 14001 & ISO 9001 certification, maintain a minimum market capitalization of 2 Billion Naira, maintain platform certifications such as Windows Hardware Certification or Android CTS / CDD Certication. Asides these obligations, they are to maintain R&D Departments within Nigeria, setup service centers, develop products that support that support Nigerian languages, make their premises available for inspection and maintain at 50% local content in every segment of the product value chain (within 3 years). To help support their efforts, they will have a 5-year duty waiver on computer components required for integration into assembled devices.

● ODMs are required to fulfil the same obligations as OEMs in order to maintain active certification with NITDA with some differences; assembly and installation of minimum of 1 million devices per annum, minimum market capitalization of 5 Billion Naira, proof of partnership with a certified OEM. They will also have a 5-year duty waiver on computer components required for integration into assembled devices.

● MNCs are required to provide a local development plan for the creation of jobs, recruitment of local engineering talent, human capital development and value creation for the local ecosystem.

● MDAs are to purchase all Hardware products locally only from NITDA approved OEMs (ensuring that these products support Nigerian Languages and the Naira sign), give a preference to companies with existing support facilities, and consider all IT projects as turnkey deployments (by including the cost of support and maintenance in the BOQ, and ensuring that vendors demonstrate appropriate systems integration capability)

● NITDA will promote and publish technical standards to serve as a guide to local OEMs, facilitate assisted purchase programs to create product demand and promote the technology adoption in education , organise regional Information Technology tradeshows with neighboring countries, discuss value creation initiatives with industry groups, and ensure that all participants in the industry benefit from investment incentives. Guidelines for Indigenous Software Development

● ISVs are required to register register company profiles detailing their products, capabilities, and structure on the NITDA Portal to ensure that the agency is aware of available resources (This service will be free of charge and devoid of bureaucracy). Also required is the ability to provide "support, continued development and maintenance" of any software built, sold or deployed. They will hold and retain exclusive rights over their copyrighted work, and have access to seed capital & incubation programs.

● SDFs are required to fulfill the same obligations as ISVs with the addition of maintenance of standard certifications (ISO 9001, CMM) in order to qualify for large scale software development bids, and development of products that support Nigerian Languages and Local use cases. They will also hold and retain exclusive rights over their copyrighted work, and have access to seed capital & incubation programs.

● MNCs are required to provide verified information and signed affidavits regarding the full security, inner workings, origin and sources of software being sold within Nigeria. This directive is designed to protect National Security. Also, Local Content Development plans will form part of requirements for registration within Nigeria and pre-qualification for projects carried out with any MDAs. This applies to new and existing MNCs within Nigeria.

● MDAs will obtain evidence of the full security of all software being used, carry out risk-based due diligence on software purchases, source and procure software from only local companies (except if capacity for developing such software doesn't exist), and only source software for which there is local capacity (Design, Development, Testing, Troubleshooting, Maintenance and Improvement). Also MDAs will ensure that all software solutions are considered as turnkey deployments (with vendors demonstrating systems integration capability)

● NITDA will partner with financial institutions, VC firms and Angel Investors to create a vibrant Venture Capital ecosystem and encourage the set-up of Business Incubators. Also NITDA will enforce the provisions in the National IT polciy as well as promote the local development of software solutions in critical sectors such as helath, security and education. Guidelines for ICT Service Provisioning

● ICT Companies are required to register Nigerian Entities with predominant Nigerian representation, provide a local content development plan that caters for the creation of jobs and human capital development, use only locally manufactured SIM cards for provision of Data and Telephony Services. They are also required to host subscriber data locally, host their websites on the .ng ccTLD, and migrate their internet peering infrastructure to local alternatives. In terms of infrastructure, they are required to use local companies to build out physical infrastructure (cell towers, base stations) ensuring that 50% of the value of this is

locally sourced, as well as use Nigerian companies to provision at least 80% of their Value Added Services with those companies creating at least 50% of the value of services provided locally.

● NITDA will facilitate discussions on the setup of indigenous ICT services providers spanning the entire value chain, foster growth by encouraging innovation in areas ranging from mobile messaging to convergence management, ensure compliance with Nigerian Content Development guidelines, and provide motivation for ICT Service providers to develop unique local content offerings. Guidelines for Network & Internet Services

● ISPs are required to register company profiles detailing their products, capabilities, and structure on the NITDA Portal to ensure that the agency is aware of available resources (This service will be free of charge and devoid of bureaucracy). They are also required to provide details (source, origin, inner workings) of Internet tools being used by the government, providing access to these tools and services in order for the government to ascertain security of communications. Other requirements include supporting rights of authors by taking down materials that infringe intellectual property rights, holding and maintaining ISO/IEC 27001:2005 certification, and providing rights to consumers to delete all personal information & records belonging to them on any service.

● MDAs will be required to host their websites on the .gov.ng domain, source Internet Services from local companies, monitor network traffic, and have access to details of the security and audit protocols put in place by the service provider.

● NITDA will develop guidelines and incentives to encourage adoption of the .ng ccTLD by public and private institutions as well as individuals. Guidelines for Data and Information Management

● Data and Information Management Firms in Nigeria are required to register company profiles detailing their products, capabilities, and structure on the NITDA Portal to ensure that the agency is aware of available resources. (This service will be free of charge and devoid of bureaucracy). They will not be allowed to host government data outside Nigeria (except with the approval of NITDA and the SGF), and must hold and maintain ISO/IEC 27001:2005 certification.

● Government MDAs will promote system wide logging to aid in forensic investigations & troubleshooting problems in government systems. Also they will required to ensure that all government data and information is hosted locally and adequately secured.

● NITDA will promote local data hosting firms and set appropriate service level requirements for service provisioning from these firms. Also NITDA will work with copyright organizations to achieve harmonization of intellectual property rights within the ICT Sector Guidelines for Human Capital Development in ICT

● MNCs are required to carry out value adding activities within Nigeria to create jobs and empower Nigerians. As an incentive for creating technology in-country, they will be eligible

for tax relief of up to 120% on general R&D (Research and Development) expenses and up to 140% on R&D focused on the use of local raw materials

● NITDA as the regulator will in turn promote specialized ICT courses and commercialization of research activities in higher institutions, partner with industry associations and certification bodies to rank ICT programs, establish incubation programs,, create a journal of ICT in Africa, setup training and skill acquisition programs, fund the creation of software development firms which will participate in the high end software market etc.

**4.0 Conclusion**

In exercise of the powers conferred on it by section 6 of the National Information Technology Development Agency Act of 2007, NITDA shall exercise the power to institute a sustainable implementation framework for the guidelines.

**5.0 Summary**

This unit has provided you detail information on purpose & objectives guidelines that are issued for the purpose of achieving the National objectives, Enforcement and Summary of Guidelines for Nigerian Content Development in ICT.

**6.0Tutor Marked Assignment**

**Q1;** Account for the Summary of Guidelines for Nigerian Content Development in ICT.

**7.0 References/Further Reading**

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## UNIT 21: GLOBALIZATION/INTERNATIONAL INSTITUTIONS

**CONTENTS**



### 1.0 INTRODUCTION

Today, organizations are conducting their businesses in the global environment. Many large firms have become multinationals doing business across national boundaries. Even small firms source their production inputs overseas. Overseas firms are producing their products here. The supply chain for many goods is global. United States firms, for instance, are acquiring firms abroad.

The vogue is to shift to international market and acquire as much market shares as possible.
Globalization goes with trade liberalization among nations and the removal of all trade barriers So that commerce and industry can flourish smoothly around the world without hitches and impediments.

### 2.0 Objectives

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

* Demonstrate the understanding of global business
* Be knowledgeable about the New International Economic Order
* Understand Foreign Trade and Comparative Advantages

### 3.0 MAIN CONTENT

### 3.1 New International Economic Order

The demand for a New International Economic Order (NIEO) especially by developing nations goes back to the first session of the UNCTAD in 1964. The various resolutions adopted in the subsequent sessions of the UNCTAD contain a systematic account of the various elements of a NIEO. At the root

of the call for a New International Economic Order lies the dissatisfaction of the Less Developed Countries (LDCs) with regard to trading, financial, technological and other policies pursued by the developed countries towards the LDCs. The developed nations have oppressed the LDCs, discriminated against them, drained their income and denied them access to advanced technology. Such policies have obstructed their development efforts, perpetuated inequalities in wealth and incomes and increased unemployment and poverty in them. There were three phenomena that gave an impetus to the demand for a new international economic order in the early 1970s. These were:

i. A severe energy crisis
ii. The breakdown of the Bretton Woods System in 1973
iii. The disappointment with development aid which was much below the United Nations target of 0.7% of Gross Domestic Product (GDP) of developing countries.
iv. The formation of the Organization of Petroleum Exporting Countries (OPEC) in 1973 and its success in raising oil prices.
v. The existence of high rates of inflation and unemployment in LDCs

Specific proposals for the NIEC were put forward at the Summit Conference of Non-Aligned Nations held in Algiers in September, 1973. The success of OPEC led the developing countries to call the Sixth Session of the UN General Assembly in April, 1974. This session adopted, without a vote, a declaration and a Programme of Action on the Establishment of New International Economic Order based on equity, sovereign equality, interdependence, common interest and cooperation among all states, irrespective of their economic and social systems which shall correct inequalities and redress existing injustices, make it possible to eliminate the widening gap between the developed and the developing countries and ensure steady acceleration of economic and social development and peace and justice for present and future generations.

In December 1974, the UN General Assembly approved the Charter of Economic Rights and duties of States. These three Resolutions constitute the documents of the New International Economic Order. The most important objectives of the New International Economic Order based on the proposals of the UN Resolutions include; international trade, technology transfer, regulation and control of the activities of multinational corporations, reformation of the international monetary system and special aid programme, and interdependence and cooperation.

### 3.1.1 International Trade

The New International Economic Order lays emphasis on a greater role of LDCs in international trade by adopting the following measures which aim at improving the terms of trade of LDCs and removing their chronic trade deficits; (i) establishment of LDC sovereignty over natural and especially mineral resources for export, (ii) promoting the processing of raw materials for exports, (iii) Increasing the relative prices of the exports of LDCs through integrated programme for commodities, compensatory financing, establishment of international buffer stocks and creation of a common fund to finance stocks, and formation of producers, associations, (iv) providing proper framework for establishing prices of raw materials and primary products so as to stabilize export income earnings, (v) indexation of LDC export prices to rising import prices of manufactured exports of developed countries, (vi) increase in the production of manufactured goods, and (vii) improving access to markets in developed countries through progressive removal of tariff and non-tariff barriers and restrictive trade practices.

It is important to recognize that foreign trade is of great importance to both developing and developed nations of the world. Trading activities occur between nations because it brings about specialization, and specialization increases output. Because the United States can trade with other countries, it can specialize in the goods and services it produces well and cheaply. Then the U.S. can trade its goods for goods and services produced cheaply by other countries.

International differences in resource endowments, and in the relative quantity of various types of human and non-human resources, are important bases for specialization. Consider countries with lots of fertile soil, little capital, and much unskilled labour. They are likely to find it advantageous to produce agricultural goods while countries with poor soil, much capital, and highly skilled labour will probably do better to produce capital intensive, high-technology goods.

### 3.1.2 Technology Transfer

The proposals of the New International Economic Order stress the establishment of mechanism for the transfer of technology to LDCs based on the needs and conditions prevalent in them. In this context, particular emphasis is on the (i) establishment of a legally binding international code regulating technology transfers, (ii) establishment of fair terms and prices for the licensing and sale of technology, (iii) expansion of assistance to LDCs in research and development of technologies and in the creation of indigenous technolo9gy, and (iv) adoption of commercial practices governing transfer of technology to the requirements of LDCs.

## 3.2 Regulation and Control of the Activities of Multinational Corporations (MNCs)

The New International Economic Order declaration also emphasizes the formulation, adoption and implementation of an international code of conduct for multinational or transnational corporations based on the following criteria; (i) to regulate their activities in host countries so as to remove restrictive business practices in LDCs, (ii) to bring about assistance, transfer or technology and management skills to LDCs. on equitable and favourable terms, (iii) to regulate the repatriation of their profits, (iv) to promote reinvestment of their profits in LDCs.

### 3.2.1 Reformation of the International Monetary System and Special Aid Programme

The New International Economic Order declaration proposes to reform the international monetary system on the following lines; (i) elimination of instability in the international monetary system due to uncertainty of the exchange rates, (ii) maintenance of the real value of the currency reserves of LDCs as a result of inflation and exchange rate depreciation, (iii) full and effective participation by LDCs in the decisions of the IMF and the World Bank, (iv) attainment of the target of 0.7% of GNP of developed countries for development assistance to LDCs, (v) debt re-negotiation on a case-by-case basis with a view to concluding agreements on debt-cancellation, moratorium or rescheduling, (vi) deferred payment for all or parts of essential products, (vii) commodity assistance including food aid, on a grant basis without adversely affecting the exports of LDCs (viii) long term suppliers' credit on easy terms, (ix) long term financial assistance on concessionary terms, (x) provision on more favourable terms of credit goods and technical assistance to accelerate the industrialization of LDCs, (xi) investment in industrial and development projects on favourable terms.

### 3.2.2 Interdependence and Cooperation

Above all, the New International Economic Order declaration lays emphasis on more efficient and equit6able management of interdependence of the world economy. It brings into sharp focus the realization that there is close interrelationship and interdependence between the prosperity of developed countries and the growth and development of LDCs. For this reason, there is need to create an external economic environment conducive to accelerated social and economic development of LDCs. Furthermore, it requires the strengthening of mutual economic, trade, financial and technical cooperation among LDCs mainly on preferential basis.

## 3.3 International Institutions using Indian economy as a case study

In our study of international institutions, we are going to use the Indian economy as a case study. We shall be looking at the objectives and achievements of Indian plans and how these plans affect the national and international institutions within the Indian economy.

### 3.3.1 History

Planning as an instrument of economic development in India goes back to the year 1934 when Sri Visves published his book "Planned economy for India." This was a bold and constructive blue print for a ten-year programme of planned economic development of India. This pioneering work created keen interest in academic circles in the cult of planning. As a result, some more books appeared on the subject by other prominent writers in India.

In 1938, first attempt was made to evolve a national plan for India, when the National Planning Committee was set up under the Chairmanship of Pandit Nehru. The work of the committee was interrupted due to the Second World War and the political disturbance following the resignation of the Congress ministries. It was only in 1948 that the Committee could release a series of reports on Planning in India.

In the next few years, eight leading industrialists of Bombay became convinced of the need for planning and took the initiative of preparing a plan of economic development for India. It was published in January 1944 and came to be known as the "Bombay Plan." It was a 15-year plan envisaging an expenditure of 10,000 Rupees. It was aimed at doubling the per capita income and trebling the national income during this period. It proposed to increase agricultural output by 130 per cent, industrial output by 500 per cent and services by 200 per cent of the 1944 figures during fifteen years.

### 3.3.2 Objectives and Achievements of Plans

India embarked on the path of planned economic development on April 1, 1951. Since then, shyer has gone through ten Five-Year Plans. A critical appraisal of the overall achievements and failures during this period of planning is attempted below:

**Objectives:**

There are various objectives that run through one or the other plan. They are:

(1) To increase national income and per capita income
(2) To raise agricultural production
(3) To industrialize the economy
(4) To achieve balanced regional development
(5) To expand employment opportunities

(6) To reduce inequalities of income and wealth
(7) To remove poverty
(8) To achieve self-reliance

In a broad sense, these specific objectives can be grouped into four basic objectives; growth, modernization, self-reliance and social justice.

We critically evaluate the performance of Indian Plans in the light of the following objectives

**(a) Growth**

One of the basic objectives of planning in India has been rapid economic growth. This is measured by the overall growth rate of the economy in terms of real GDP. The overall growth rate of the economy 1950 – 2006 in terms of GDP at factor cost at constant prices has been characterized by extreme variations from year to year. Consequently, the targets of growth rate fixed for various plans were not achieved except for the First, Fifth, Sixth, Seventh and Eight Five-Year Plans. In the First Plan, the growth rate of 3.7% per annum was achieved which was higher than the estimated growth rate of 21%. During the second plan, the actual growth rate was a little less than 4.2% as against the targeted growth rate of 4.5%. In the Third plan, the actual growth rate of 2.8% was much lower than the targeted rate of 5.6%. The Fourth Plan also showed a large decline in the actual growth rate which was 3.4% as against the estimated rate of 5.7%. But the Fifth Plan achieved a higher growth rate of 5% against the targeted rate of 4.4%. The Sixth Plan had set the target growth rate of 5.2% but achieved a higher growth rate of 5.5%. The Seventh Plan achieved the growth rate of 5.8% against the envisaged target of 5%. The Eight Plan achieved a growth rate of 6.8% as against the target of 5.6%. The Ninth Plan had the growth rate of 5.5% against the target rate of 6.5%, and the Tenth Plan 7.6% against the targeted of 8%. But except for the year 2002-2003, the growth rate was 8.6% for the remaining four years of the tenth plan.

**(b) Modernization**

Modernization refers to "a variety of structural and instituti8onal changes in the framework of economic activity." A shift in the sectorial composition of production, diversification of activities, and advancement of technology and institutional innovations have all been part of the drive to change a feudal and colonial Indian economy into a modern and independent entity.

**National Income:** The sectorial distribution of national income reflects the str45uctural transformation of the Indian economy. The composition of GDP shows significant changes over the period 1950-2006. In 1950-51, 59% of GDP came from the primary sector (agriculture) which dropped to 18.5% in 2006. This is a concomitant result of the development process whereby the primary sector gives place to the secondary sector (industry) and the tertiary sector (services) in the economy.

**Agriculture:** Modernization and structural changes in agriculture have played an important role in the process of planned development. The country has made giant strides in the production foodstuff especially grains, cash and horticultural crops to meet the consumption requirements of the growing population, the raw material needs of the expanding industry and for exports. The phenomenal increase in the output of food-grains by four times has been due to the spread of high-yielding varieties of inputs, extension of irrigation facilities and water management programmes, establishment of a system of support prices, procurement and public distribution, promotion of

agricultural research, education and extension, and institutional arrangements to suit small and marginal farmers.

**Industry:** The main component in the drive for structural diversification has been towards modernization and diversification of industr5ies. Over the past 50 years. India has achieved a broad-based industrial development. Apart from quantitative increase in the output of industrial products, the industrial structure has been widely diversified covering the entire range of consumer, intermediate and capital goods. Chemicals, engineering, transport, petro-chemicals, synthetics, electronics, etc. have made rapid strides. In most of the manufactured products, the country has achieved a large measure of self-reliance.

**Social Services:** Modernization is also reflected in the spread of social services. There has been a significant increase in development expenditure on social services whose share in GDP grew from 3% in 1950 to 28% in 2006. There has been a marked expansion of health services. The number of doctors, nurses and hospitals has increased substantially, and villages have been electrified. Drinking water has been supplied to many villages. There has been a spectacular spread of education in rural areas. The number of secondary schools, colleges, universities, medical and engineering institutes has multiplied manifold.

**Self-Reliance:** Self-Reliance means "a reduction in the dependence on foreign aid, diversification of domestic production and a consequential reduction in imports for certain critical commodities and the promotion of exports to enable us to pay for imports from our own resources. A major constraint towards achieving the objective of self-reliance has been unfavourable balance of payments. The deficit in current account balance continues to increase till the end of the Seventh Plan. It started declining from the Eighth Plan.

## 4.0 CONCLUSION

The developed nations have oppressed the Less Developed countries (LDCs) and discriminated against them, drained their income and denied them access to advanced technology. Such policies have obstructed their development efforts, perpetuated inequalities in wealth and incomes and increased unemployment and poverty in them. The phenomena that gave impetus to the demand for a new international economic order in the early 1970s include: severe energy crisis, the breakdown of the Bretton Woods System, the disappointment with development aid which was much below the United Nations target of 0.7% of Gross Domestic Product (GDP) of developing countries.

## 5.0 SUMMARY

The vogue is to shift to international market and acquire as much market shares as possible.
Globalization goes with trade liberalization among nations and the removal of all trade barriers
So that commerce and industry can flourish smoothly around the world without hitches and hazards.
International operations go with cultural differences which must serve international firms and businessmen for success in the international markets.

## 6.0 TUTOR-MARKED ASSIGNMENT

*What are the main issues that led to the demand for a New International Economic Order by developing countries?

*List the major factors that gave impetus to the demand for New International Economic Order.

*Discuss the advantages of international trade.

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