

**COURSE
GUIDE**

**LIS 327
INTRODUCTION TO COMPUTER SYSTEMS**

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CONTENTS

Introduction	iv
Course Objectives	v
Working Through This Course	v
Study Units	vi
Presentation Schedule	viii
Assessment	viii
Final Examination and Grading	ix
Course Marking Scheme	ix
How to Get the Most from The Course	ix
Facilitation	x

INTRODUCTION

Welcome to **LIS 327: Introduction to Computer Operating Systems**. This is a two-unit credit course (2-unit), being a prerequisite and also mandatory for all the undergraduate students in the Department of Library and Information Science. The course is structured to assist undergraduate students to identify, understand, recall, discuss, and apply the knowledge of computer operating systems in library and information center environments. Therefore, the need to comprehend and apply basic knowledge, skills and strategies of computer operating systems to meet diverse purposes of networking with friends and operations at the workplace becomes imperative. Computer Operating System host software application programs that run on computers. Computer Operating System is pervasive among scholarly disciplines of computing, engineering, library and information science, health informatics, information systems etc. Therefore, it is essential to note that the computer' operating system is fundamental in present day library and information centres/organization. They can be used by individuals and organizations to host series of applications for the present-day of routine and specialized tasks. The reason that necessitates the use of computer operating system in library and information centres was due to the information and communication revolution that pervades all spheres of lives, including the library and information science profession. Other organizations, such as health institutions, banking/financial, construction and manufacturing just to mention a few, are using computer operating systems to host software applications and render quality delivery to meet their information users' needs.

The benefits associated in the application of computer operating system has made many library organizations to strengthen the technical know-how of their staff. This they have done through advancing the skills of networking tools in the use computer operating system. The skills of networking tools have the storage capacity to preserve the required products and materials for work operations. Getting along with computer operating systems for organizational performance is the utmost vision and mission statement. This will help improve challenges caused among many library practices and related institutions.

This course 'introduction to computer operating system' prepare students with specific cognitive and behavioral learning objectives in their academic journey or pursuit. This course could also benefit students for personal development, thus transforming their attitude, skills, knowledge, and practices of how tasks could be accomplished through the support of the computer operating system. Continuous use of the computer system could expose individuals to the knowledge of different components associated with the computer operating systems.

COURSE OBJECTIVES

By the end of this course, students should be able to:

- i. Understand what computer operating system entails and its implication in present-day libraries and information centers and associated organizations
- ii. Discover and know how best to apply navigation techniques and tools associated with computer operating system approach, in the fulfilment of student educational pursuit and professional development.
- iii. Discuss the usefulness and efficacy of computer operating system in 21st century digital era where digital technologies have become part of human lives, especially for library and information centres and associated organisations to render quality services.
- iv. Develop the attitude of acquiring quality skills and knowledge required to use computer operating system among librarians, libraries and information centres.
- iv. Determine the effect associated with computer operating approaches in libraries and information centres
- v. Articulate the standards required for practical approaches that could strengthen computer operating systems in present-day libraries and information centers
- vii. Understand the philosophies, framework, and practices of application of computer operating systems in libraries and information centres and associated institutions.

WORKING THROUGH THIS COURSE

The completion of this course by students depends on their full participation in attending classes, doing assignments as at when due, and seating for the examination. In other words, students are anticipated to participate in both the theoretical and practical parts of the course. Students are mandated to read the study units very well, listen to some of the video's links provided which point to what each section entails, attend to all assessments, study very well all recommended books and other related materials that would boost students' understanding of the course unit provided.

The course is designed into study units, each study unit is classified into the following sub-headings: introduction, intended learning outcomes, main content, summary, conclusion, references and further readings. The introduction, based on the subject deliberated on, indicate a summary of what is examined and anticipation meant to be covered in the study unit, before it was further expanded or broken down into segment of analysis, describing things to see as enclosed in the study unit. It is mandatory for

students to read and familiarise themselves with the intended learning outcomes (ILOs) that give a draft of what students are expected to complete at each study unit. This would help the students to evaluate their learning progressions at the end of each unit, to determine whether they have accomplished the intended objectives of the study unit. To complete the intended learning outcomes, the content of each segment is presented in modules and units with LIS 327: Computer Operating System.

The videos and links provided in this course unit are to support and strengthen this study of the course LIS 327: Computer Operating System. Kindly copy and paste the link address as indicated in each study/course unit into a browser and follow the directives as shown on Youtube while watching the video. There are portions where students might have to click and also skip in order to avoid adverts that were part of the video, in order to get to the main content. Please do and listen attentively as the video plays. There is the segment where the student will have to read offline, make notes and jot down points that could re-direct them back to what they have already studied and extent covered in the entire course unit. If probably, it would be advisable you download the videos to view and watch it offline, as that will give you much ease considering saving of Internet data and time when you want to visit the site online again.

You can also download and print the entire manuscripts for the LIS 327 course study for easily accessible and reading whenever you want to study. This will give you free space where you will not have to open your computer all the time. Otherwise, if you are good at reading digitally, save it in your computer or external drive-in order not to download always. What is deliberated on, in each unit outlines vital summary of the points that needs to be measured, thus become foremost as guide to other parts of units in the whole journey of the study. The conclusion takes the student to the pinnacle of the study and prominent points or lesson that needs to be taken into consideration in the unit being covered.

In each study unit, two assessments are required– the formative and the summative. The formative assessments indicate how the student will evaluate their learning processes. These are presented in the form of text questions, discussion forums, and self-assessment exercises. The summative assessments are based on the academic performance of the student as required by the university whether the student has met the minimum requirements stipulated on the course being studied. These are summarized in Computer-Based Test (CBT), serving as continuous assessment and final degree examinations for the course being studied. A minimum of three computer-based tests will be given to the student with one final examination at the end of each semester. It is compulsory for every student registered for this course to take all computer base tests and

the final examination and passed the course before they could graduate from the university.

STUDY UNITS

There are 15 study units in this course which are divided into six modules. The modules and units are presented as follows:

Module 1 Computer Operating System In Libraries

- Unit 1 Overview/Concept Objectives, Features, History and Types of Computer Operating System, Unix Operating System, History of Unix Operating System and Its Popularity, Features of Unix Operating System, Component of UNIX Operating System, Basic Operations of UNIX
- Unit 2 Function, Processes, Techniques, Components, Policy, Benefits, Barriers, Principles, and Practices of Computer Operating System
- Unit 3 Benefits, Barriers, Principles, and Practices of Computer Operating System

Module 2 New Technologies in Computer Operating System

- Unit 1 Definition, Objectives, Features, and Types of New Technologies in Computer Operating System
- Unit 2 Functions, Processes, Techniques, Benefits and Challenges of New Technologies in Computer Operating System
- Unit 3 Applications of the New Technologies in Computer Operating System

Module 3 Application and System Software

- Unit 1 Definition, Objectives, Features and Types of Application and System Software
- Unit 2 Functions, Processes, Techniques, Components, Benefits, and Challenges of Application and System Software,
- Unit 3 Uses, Implication and Distinction between Application and System Software

Module 4 Knowledge, Skills and Virus in Computer Operating System in Libraries

- Unit 1 Overview, Concept, and Purpose of Knowledge and Skills in Operating Computer System
- Unit 2 Types of Knowledge, Skills, and Reason for the Knowledge and Skills in Operating Computer System

Unit 3 Overview, Types and Features of Networks required in Computer Operating System; Virus and their types and How to Restrain Virus in Computer Operating System

Module 5 Micro and Mini Computers in Library And Information Work

Unit Overview, Definition, Objectives, Features, History and Types of Micro and Mini Computers in Library and Information Work

Unit 2 Functions, Processes, Techniques, Components, Benefits, and Challenges of Micro and Mini Computers

Unit 3 Application of works which Micro and Mini Computers are used for in Libraries

(i) Maintenance culture of micro and mini-computer in libraries

(ii) Reasons for maintenance of micro and mini-computer in libraries

(iii) Staff attitude towards the use of micro and minicomputer in library work

PRESENTATION SCHEDULE

In order to have a clear understanding of what the course study entails, a presentation schedule is provided. The presentation schedule directs the student on essential dates to take note of, especially in the completion of computer-based tests, assignments, participation forums or discussions, if any, and every other material and video that needs to be examined. Remember that the submission of all your assignments must be timely and appropriate as stated in the course study. Please, there is need to guide against delay or postponement and plagiarisms while submitting your classwork/assignment given to you to do. Please bear in mind that, plagiarism is a criminal offense, as such, it should be avoided.

Note: The student will earn 10% score if he/she meets a minimum of 75% involvement in the course study, forum discussions and portfolios, or else the student will lose the 10% in their total score. The student is expected to upload their portfolio through Google Doc. The expectation of students in their portfolio consists of the notes or jotting made during their time of study of each of the course unit and modules made available to them. This comprises of all activities and time spent from the beginning to the end of the course of study in the entire duration of this course LIS 327: Computer Operating System.

ASSESSMENT

Two core forms of assessment are required in this course to earn a pass mark. The first assessment is Tutor-Marked Assignment (TMAs) that are

included in each study unit. Students are advised to submit without delay so that they do not pile up, otherwise, it could discourage them from advancing to the next stage of another study unit. The TMAs is part of the continuous evaluation module that are marked and recorded on a continuous basis. It amounts to 30% of the total scores from the cumulative. Therefore, students are instructed to be serious with it, because it will assist and support them to pass the course. The TMAs will be scheduled according to the University calendar, as students do not need to panic. The second assessment will be the final examination, which will cover everything that was taught in the course LIS 327. Students are encouraged and advised to adhere to all scheduled calendar in the University such that, they do not miss the examination.

FINAL EXAMINATION AND GRADING

After the completion of this course, students will be required to seat for the final examination in Introduction to Computer Operating System'. The duration of the examination will last for 2-hours and the grade point of the course is 70%. Importantly, most of the questions that are given to students are what they have previously had in the self-assessment of the TMAs, as such; students need to acquaint themselves with all their reading materials. A continuous and thoughtful understanding of the course/study materials would assist students to do well in the program. Therefore, it is expected for students to apportion time to study very well in order to have good grades. Students are instructed to use their time cautiously so that, they do not miss any of the study units and assessments. It is anticipated that the Tutor-Marked Assignment or activities would enable the students to face their studies very well as everything in the course is comprehensive, even before the final examination is written.

COURSE MARKING SCHEME

This table represents the layout of total course marks

Assessment	30% (Undergraduate) 40% (Postgraduate)
Final Examination	70% (Undergraduate) 60% (Postgraduate)
Total	100% coursework

HOW TO GET THE MOST FROM THE COURSE

In order to get the best from the course, the student needs a functional personal laptop and access to the Internet. This will ensure that the student has access to the course materials, such that, learning becomes stress-free and the course materials can also be accessed without geographical boundaries (wherever and anytime). The student will use the Intended Learning Outcomes (ILOs) to guide themselves through the self-study approach in this course LIS 327. It is expected that, at the close of each unit, students should be able to evaluate themselves whether they have understood and/or learn the ILOs, such that, the purpose of that unit course is achieved.

This could be achieved through careful preparation by discussing with peers and taking notes during the study sessions. The preparedness of the student is based on the notes and jotting taken at the discussion forum and personal study time in each unit course. It is expected for every student to join the online real-time facilitation planned on the schedule. Any time a student missed real-time facilitation planned schedule, without wasting time, the student should create time to go over the recorded facilitation session, in order not to lag behind other students. The missed time facilitation session of any study unit will be video recorded, that will be uploaded on the online platform. Apart from the real-time facilitation session, it is expected at all times that, the student should watch the video and audio recorded if any in each unit course. The video/audio helps to review salient points that the student could have missed in the online facilitation session in each unit course. Students can access the audio or videos by clicking on the links provided in the text of each unit course/study concluded at the end of the course page.

It is expected that students should undertake and work around all self-assessment exercises, such that, they leave nothing behind regarding the course content of this study. Lastly, adhere to all instructions given in the class regarding each unit course.

FACILITATION

Bear in mind that, as a student, you will be given an online facilitation. The online facilitation is an interactive beginner's centre, where students learn. The style of facilitation can be asynchronous and synchronous. For the asynchronous facilitation, your facilitator will:

- Present the theme of the study unit to you for the week;
- Lead you through a summary forum discussion on what needs to be covered;
- Manage all the activities in the online platform;
- Score and grade all activities when they are needed;

- Upload students' scores into the university recommended platform;
- Support and help students learn in whatever regards provided the whole course is covered. This might include sending personal mails for communications purposes and follow up in doing their assignment/studies.
- Send videos and audio lectures on WhatsApp, emails, Facebook, LinkedIn, among other social media sites to students, apart from the normal upload on the online facilitation platform.

For the synchronous:

- Students are expected to spend a minimum of eight hours of online actual time contacts in the course contents. This implies watching video conferencing in the Learning Management System. The eight hours consists of one-hour contact for eight times.
- It is expected that, after spending one hour each watching the video conferencing, the video will be uploaded for possible viewing at student's own time and speed.
- The tutor or facilitator will focus on key themes that are most important and known to students in the course.
- The facilitator is the person to present the online real-time video facilitation timetable before the start of the course unit.
- It is the responsibility of the facilitator to take the students through the course guide at the beginning of the first lecture even before the facilitation begins.

Note: Please do not fail to contact your facilitator, in the event that you need help or further clarifications. You can do so based on the following:

- When you do not comprehend any part of the study units or the assignments given.
- Have challenges with the self-assessment exercises.
- Have questions or issues with an assignment or your tutor's comments on an assignment that was given.
- Please use the contact provided for technical support as well.

Students are expected to read all recommended reading materials. Make comments and notes as given by their facilitator especially on those relating to assignments; participation in the forums and discussions. This provides the student the privilege to socialize with others in the course of the programme. Students are encouraged to discuss any problem encountered during their course study. This would help them improve tremendously and learn better while they prepare for course facilitation. It is also advisable for students to outlined list of questions before the

discussion session, so as to gain more knowledge from peers and facilitator. This will make students to learn broadly while participating actively in the debate's forum.

Lastly, facilitator or course lecturer should respond to the questions, observations and comments raised. This will help NOUN to know areas of weakness and how best to advance on them for possible future review of the course materials and lectures.

MAIN COURSE

CONTENTS

Module 1	Computer Operating system in Libraries	1
Unit 1	Definition of Concepts in Computer	1
	Operating System In Libraries	
Unit 2	Function, Processes, Techniques, Components and Policy of Computer Operating System	33
Unit 3	Benefits, Barriers, Principles and Practices of Computer Operating System	58
Module 2	New Technologies in Computer Operating System	72
Unit 1	Definition, Objectives, Features, and Types of New Technologies in Computer Operating System	72
Unit 2	Functions, Processes, Techniques, Benefits and Challenges of New Technologies in Computer Operating System	88
Unit 3	Applications of the New Technologies in Computer Operating System	100
Module 3	Application and System Software	104
Unit 1	Definition, Objectives, Features and Types of Application and System Software	104
Unit 2	Functions, Processes, Techniques, Components, Benefits, and Challenges of Application and System Software	118

Module 4	Knowledge, Skills and Virus in Computer Operating System in Libraries	126
Unit 1	Overview, Concept, and Purpose of Knowledge and Skills in Operating Computer System	126
Unit 2	Types of Knowledge, Skills, and Reason for the Knowledge and Skills in Operating Computer System.....	144
Unit 3	Computer Virus, their Types and Ways of Preventing a Virus in Computer Operating System	162
Unit 4	Overview of The Application of Mini and Micro Computers in Library and Information Profession	168

MODULE 1 COMPUTER OPERATING SYSTEM IN LIBRARIES

- Unit 1 Definition of Concepts in Computer Operating System In Libraries
- Unit 2 Function, Processes, Techniques, Components and Policy of Computer Operating System
- Unit 3 Benefits, Barriers, Principles and Practices of Computer Operating System

UNIT 1 DEFINITION OF CONCEPTS IN COMPUTER OPERATING SYSTEM IN LIBRARIES

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Overview of Computer Operating System
 - 3.2 Concept of Computer Operating System
 - 3.3 Objectives of Computer Operating System
 - 3.4 Features of Computer Operating System
 - 3.5 History of Computer Operating System
 - 3.6 Types of Computer Operating System
 - 3.7 Unix Operating System
 - 3.8 History of Unix Operating System and its popularity
 - 3.9 Features of Unix Operating System
 - 3.10 Components of Unix Operating System
 - 3.11 Basic Operations of Unix
- 4.0 Summary
- 5.0 Conclusion
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

Presently, irrespective of the geographical location and organizations, every human being needs computer operating systems in accomplishment of different task. The responsibility attached to computer operating systems has made the operations in organizations more diverse in functionality. Computer Operating system is indispensable in the 21st century because it can be used for data, information and knowledge re-organization. Another catalyst for which it can be applied is documenting decision and planning made by every individual in the organization, hence we could say that organizations

rely on computer operating systems to deploy software for accomplishing tasks. Therefore, library and information centres could use it to organize and manage their information materials. Consequently, the success of organizations in the workplace learning and entire lives rest on the application of computer operating system. There is the slogan known as Garbage in, garbage out. It means what you give to the computer is what it gives back to you in the input and output devices. Therefore, to have access to the data or information in the computer operating system, someone should have also understood what the computer operating system entails. Those, with the basic know-how could access the right information without much difficulty. This implies that, since the computer operating system is a machine that is required for everything that someone does either at home, schools, offices, churches among other places, it should be guided with all responsiveness, in order to appropriate its longevity. The use of the computer operating system is believed to advance the move of access and service delivery to humanity across the world.

For students to excel in their academic pursuit, it is anticipated that they should be equipped with activities that surround the use of computer operating systems. This can be achieved through continuous teaching and learning in the classroom's environment. Other ways through which students could be equipped is giving assignments and personal engagement, and training in the use of computer training environment. The acquisition of the computer operating system could result to students' education, environment, and family background among other factors.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this unit, students should be able to comprehend and explain:

- The meaning, concept, and objectives of a computer operating system
- Highlight the vitality of the features associated with the computer operating system
- Explains the history and types of computer operating systems found in organizations
- Explain the meaning and history of Unix operating system
- Highlight the features, components and basic operations of Unix Operating System

3.0 MAIN CONTENT

3.1 Overview of Computer Operating System

The computer operating system' is not a new terminology globally, with regards to its use among institutions, organizations and individuals. This can be established in diverse extant literature in databases of Web of Science, Scopus, Google and Ebscohost among others. The understanding that surrounds computer operating system is that the computer which is seen automated or electronic devices comprises an operating system, otherwise it is just a mere paperweight or empty frame or electronic box without any features. It is the operating system (OS) in the computer box that made it what it is today (Siyavula Technology Powered Learning, n.d). The operating system has the capability of managing the computer memory which does several operations in the hardware. The operating system is sustained by the software that drives the different programs that runs in the system.

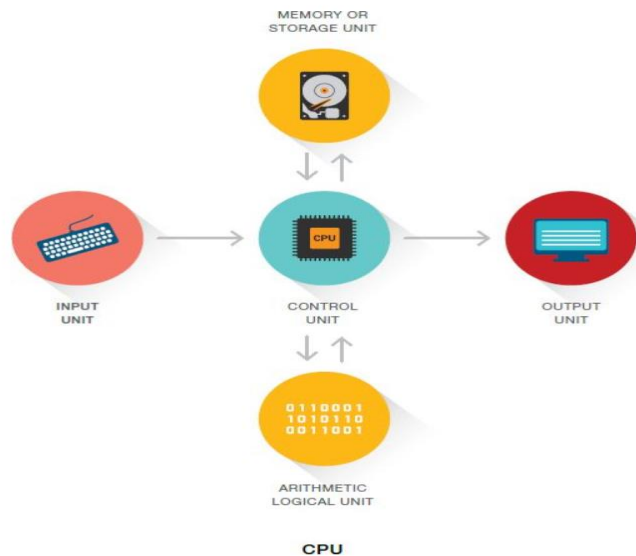
The effort put in by the operating system enables the computer to accept data and information for proper handling before it goes through rigorous overhauling and manipulation into their proper order such that it could become useful information and knowledge required for planning and decision making (Siyavula Technology Powered Learning, n.d). The processed information and knowledge are stored or kept in the computer memory called the central processing unit. Whenever someone needs to retrieve any information and knowledge from the computer, the person goes straight into the central processing unit where the information and knowledge are stored for future retrieval (Siyavula Technology Powered Learning, n.d). The indication shown in the image below stipulates what is most significant on how the operating system rotates and functions in the computer box and these comprises of the following's items:

- **Hardware:** The hardware is the mental apparatus of the computer, which could be called the machine tools of the computer. Examples are: central processing unit, monitor, mouse, keyboard, graphic cards, sound cards, speaker, motherboard etc.
- **Software:** The software is identified as applications or programs that comprises of different gradient of commands known as computer language which direct the computer on what it needs to do or how to operate. Examples are: Firefox, Google Chrome, Internet Explorer, Android, Ios, Linux, macOS, windows, just to mention a few.

Both the hardware and the software are anchored on the keyboard and mouse which helps to input data or information in the computer. Other's components such as monitors, printers, speakers, hard drives, flash

disks, routers are used for either output or communication purposes. The computer operating system has become so useful in present day information and knowledge economy such that, no individual or organizations could do away with it. Therefore, the need to create more awareness regarding its application and use among non-literate people, especially those living in the villages and cities in developing nations, becomes significant, since it's already a known phenomenon across the globe, regardless of who we are and where we come from in the world (Siyavula Technology Powered Learning, n.d).

Porter and Chester Institute (2020) were of the view that the computer operates depends largely on how the user was able to speak to the computer. This understanding of the computer language is sustained through technical know-how of the computer operations. Therefore, it is essential to note that, the person using the computer should have basic knowledge of the operating system, such as the file system, scheduler and device driver. Without the basic knowledge of the operating system in a computer, it becomes difficult to regulate the general health of the computer (Porter and Chester Institute, 2020). Continuous maintenance of the computer would help to detect when there are malfunctions before troubleshooting could take place. When troubleshooting is carried out in the systems, it protects it to function better.



<https://intl.siyavula.com/read/cat/grade-10-cat/concepts-of-computing/01-concepts-of-computing?id=ch1.3#ch1.3>

Figure 1: Output of different components of the computer operating system

3.2 Concept of Computer Operating System

Computer operating system is known worldwide, except for different scholars in some developing nations of the world. Although, similarities

abound in the various interpretations and definitions that are given towards computer operating systems. Learn Computer Science (n.d) notes that, the understanding gotten from the lecture notes on operating Systems/Introduction to Operating System (n.d) indicates that, the operating system is an organized system that is designed principally to deliver services meant for the running of applications in the computer system (operating Systems/Introduction to Operating System, n.d).

The understanding of the concept of a computer operating system could be seen differently. The first, is the computer, while the other is the operating system. The computer according to Adebisi (2013) is an electronic device that functions under the regulator of commands that are passed to the warehouse of the memory of the computer. The action passed tells the drivers and programs what is to be done. The computer could accomplish the different tasks from accepting data (input), to the stage of handling the data through arithmetic and logical analysis, before it produces the output commencing from the processing, thereafter stores the outcomes for future use.

The capability that the computer has is based on the effort of drivers and programs carrying out different tasks or responsibilities (Adebisi (2013). The main drivers and programs that control the activities of the computer is the central processing unit. The central processing unit is accessed by the monitor, keyboard, and mouse. Although there are other peripherals required for the accomplishment of a task (Adebisi (2013). It is imperative to know that, as important as data or information, if they are not processed, they become meaningless.

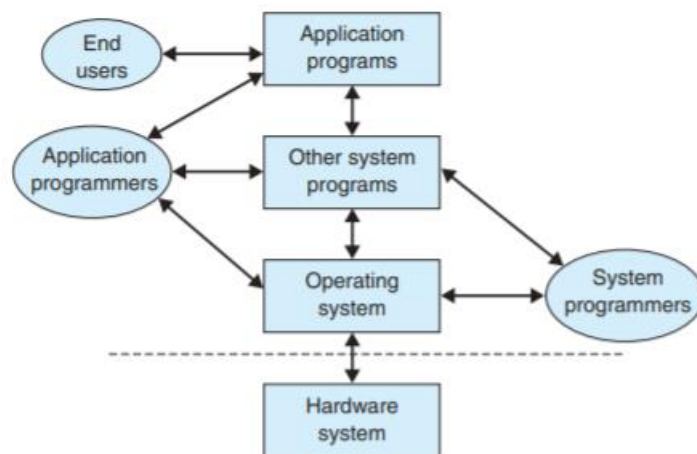
Jones and Bartlett Learning (n.d), gave their definition of interpreting operating system to mean intermediate machinery that surrounds the application program and the hardware. Therefore, the application program should be able to provide services to users based on their information needs of using the computer. Besides, it could also afford the users the control measure of the computer for appropriate effective and efficient functionality (Jones and Bartlett Learning, n.d).

The operating system has different components that bring its functionality to reality and these cut across the central processing unit being the main engine. This engine ensures users' processes of application are well articulated and stored after processing. Another point made by Jones and Bartlett Learning (n.d) regarding the operating system is that, it is a big and composite system that offers several assemblies of services to other users of the system. This scenario brings accessibility, easy to use and controlling set of facilities which are provided to the user, from end to end of the application of the program in the computer system (Jones and Bartlett Learning, n.d). It could be

noted that, the operating system helps to manage all the transactions in a well-structured method. Some examples of the computer operating system and their components and facilities are presented in figure below for observation purposes.

Bigelow (2021) opines that, the operating system is a structured program that is loaded into the computer in order for it to manage other submissions made within the system. The application programs sort the operating system such that, using it for various services would not be a problem based on the interface. Therefore, users could interact straight through the operating system in line with the command-line interface (Bigelow, 2021). The operating system influences both computer software and software development. Without the operating system, the computer would not be able to carry out its functionality based on the fundamental tasks of the use of disk storage, network interfaces among others.

The computer operating system consists of software, being the driver of the system. The hardware is the entire object that could be seen with the physical eyes, while the software is the programs of system software and application software. This helps in the interaction of activities that take place on the computer. The interface which the system and application software provides in the processing of any data/information cannot be quantified. Therefore, a functional operating system is required for all the interactions in the computer to align together. The operating system needs well-built-up support of the antivirus to guide against attack of the systems. The understanding from extant literature reveals that the operating system which drives the computer functionality is one of the utmost significant software that offer the computer the ingredients through which they operate. It controls the various activities applied within the computer.



http://samples.jbpub.com/9781449626341/26341_CH01_Garrido.pdf

Fig 2: Image of the computer operating system



Fig 3: Different image of the hardware



https://nptel.ac.in/content/storage2/courses/106108101/pdf/Lecture_Notes/Mod%201_LN.pdf

Fig 4: Image of the components of computer operating system

Video  1. <https://www.youtube.com/watch?v=vBURTt97EkA>

Video  2. <https://www.youtube.com/watch?v=RhHMgkUdhdk&t=4s>

Video  3. <https://www.youtube.com/watch?v=26QPDBe-NB8>

Video  4. <https://www.youtube.com/watch?v=ACsLvXuaKxw>

3.3 Objectives of Computer Operating System

Based on the emphasis made above regarding the overview and concept of computer operating systems, different objectives were deduced and this cut across (i) suitability, (ii) proficiency, (iii) capability for application of program, (iv) examination of the system overhauling, and (v) interference. This implies that the computer operating system should be convenient to use at every point in time, produce the efficient result and give the user the ability to navigate based on the operations carried out whenever in use. The study by Niu (2003) referred to the following as crucial in any computer operating system and they include:

(i) Usability: The essence of having a computer operating system is for it to serve diverse purposes and without the intention to use it; it would not have been created or developed at the first instance. Therefore, the service which the computer operating system offers varies from one end user and context to another. The usability of the computer operating system is anchored on devices of mouse, keyboard, monitor, printer and the application programs that run the system. With the human interface who operates the computer, these devices cannot function on their own, hence human play a significant role in the functionality of the computer operating system.

(ii) Computer languages: The computer operating system languages is another objectives that must be taken into consideration. Without understanding the computer operating languages, it is practically difficult to operate the computer. The languages is not easily understood by a lay man like we understand the general English language used on daily basis, especially when it comes to processing data and information that has been inputted into the system. The languages are high level language used for the command or instruction in the computer. They comprise of machine and assembly languages, algorithmic languages, FORTRAN, C programming language, business-oriented languages, structured query language, beginners' all-purpose symbolic instruction code, among others too numerous to mention. Although too many to mentioned but only few are used in most cases. Therefore, the user of the computer should endeavour to learn and understand the computer languages before its operation and use become easy and interest, otherwise such user would continue to struggle for a very long time. This is also application to those who developed or created the computer. The programming languages has different dimension and purposes that require a lot of rigour before someone could understand it very well. A lot of overarching complexity is dealt with before the computer languages could be understood.

(iii) Resource manager: Another significant objective of the computer operating system is resource manager. There are varieties of information and data stored in the central processing unit of the computer operating system. Therefore, in order to have access to the information stored in the system, it must have been well processed and managed or preserved for future use. The operating system in the computer helps to manage the resources that are stored in it. This relates to how efficient the computer system is capable to manage all operations/activities when services are carried out. The inputted data and information based on application programs continues to keep track in actualization of the services offered by the system. The computer operating system searches through the hardware activities for easy accessibility to the information stored, thereby enforcing control over the entities which uses the various services for efficient management. Without proper resource manager of the operating system, all the processed and stored information become a wasted effort. Even though the operating system has different program that gives instruction, the function of the central processing unit cannot be undermined. The central processing unit is capable of controlling the main memory together with instruction required in getting information or data to process at any given point in time. The ability to utilize the facilities of the hardware, also give opportunity to plan different processes that needs to run in exchange of data and information within the central processing unit.

(iv) Maintenance culture: The operating system that makes the computer to function very well has a very good maintenance culture with regards to all the activities that take place in the system. Whenever a new version of the hardware or software is developed, the old version usually upgrades to the new version based on the commands that has been directed to the system to operate on. The essence of the upgrade is to meet up with users' information needs. Although some of the software that runs the system might not be completely perfect but Microsoft has device it such that, no matter the nature of the software, it has diverse work to perform. The maintenance culture of the system applies to both the users and the operating system based on different program that has been designed or built in the system. The maintenance of the system is to bring it to live and give the system longevity. Based on continual maintenance of the computer operating system, user may find their task easy to handle, user friendly and finish on time. The maintenance culture helps to improve the utilization of the system such that, the programs monitor events one after the other for progression plan, thus running several commands spontaneously.

(v) Multi-programmed batch systems: Interestingly, the nature and extent of work operations carried out by the computer operating system makes it a multi-programmed batch system. Most of the tasks that are

inputted into the system are in batches hence it is called a multi-programmed batch system. The language which the computer operating system understands is different from the ordinary human languages hence it is imperative to program every task or activities as it could be understood by the computer. As known and called all over the world, garbage in, garbage out. This connotes that, the data or information that are processed by the system based on certain commands given should be understood by the computer, otherwise, it becomes a difficult task for whoever that is operating the system. In this regard, when processing any document, certain operations based on programs has to wait for that first one to finish before another one could start. Otherwise, multiple programs can be run concurrently due to the number of activities on ground that requires accomplishment. If it happens that there is need for more programs, it could also accommodate them based on the efficiency of the operating system. While considering multi-programming, there is need to create space for each program so that it will not invade into others. But above all, maintenance of the system is what would bring about achievement of this task.

(vi) Time sharing system: The computer operating system has a time-sharing mechanism that enable it share task that are processed, especially with multiple programming activities that require uploading. Although the system may be efficient but problems are bound to arise sometime hence the need to share slot of task. This means that, some of the jobs sent may arrive late due to the fact that previous ones sent have not finished processing. In this regard, the user will have to wait for those ones to come out; hence we have time sharing as one of the objectives for computer operating system. If it happens that in the course of time sharing of different jobs sent for processing, the user of the system may have to make an interaction especially when the work got jammed. The user may have to re-set or sent for processing in their different sent manners. This one usually happens when printing documents from the system. In order to expand on this goal, a computer operator may have to apply multi-programming approach especially when the work is slow or got jammed. The use of time-sharing system is mostly peculiar to big organization whose tasks are multifarious in nature.

The above-mentioned objectives are significant in present day environment considering dynamism of human interface and task which require accomplishment. There is no libraries and information centres today, that may not consider some of the mentioned objectives. Therefore, as librarians and information specialist continue to grow in their profession, the need to consider the above becomes crucial, as they would continue to make use of computer operating system in their offices, homes, and schools.

In the same vein, Devikarani (n.d) mention the following associated with computer operating system and they are:

- Convenience
- Efficiency
- Hardware parts
- Management of the system resources

To this end, Educate Tech (2020), outline the objectives of computer operating system as:

- Hardware generating construct
- Permit resources to be managed
- Provision of effective user interface
- User friendliness
- Use program development
- Expansion of illustration within program control
- Has protection measures and supervision mode
- Permit disk admittance to different file system
- Influences the system for diversion of operations
- Error discovery and control
- Distribution of resources
- Memory management
- Program implementation

In consideration to Guru 99 (n.d), comments, some of the points raised were:

- Multitasking system
- Diversion processes
- Time sharing
- Idea of courses
- Environmental friendliness
- Memory space
- Management of duration of operation
- User group
- Fabulous user

Ranchi University (2018) gave consideration to the following as objectives of computer operating system:

- Booting
- Memory organization
- Loading and execution
- Data safety
- Disk management
- Process controlling

- Device monitoring
- Printing supervisory
- Providing interface



<https://www.educba.com/features-of-operating-system/>

Fig 5: objectives of computer operating system

3.5 History of Computer Operating System

The history of computer system as an entity has long existed for over eight decades, between 1936 and 1938, when Z1 was created. Although the first existed computer system was only using one program at a given time. Gradually, as the creation of more computers begin to erupt; more software programs were included into the system, which created a better opportunity for the start of operating system today. One of the factors that made the program in the system more complex is the code required to run the system were designed such that communication with connection to the hardware were not as easy as expected for the system to operate (Mike 2019). This led to the development of more software that could facilitate the execution of programs of the computer. The first ever developed computer system was created in 1950 when the computer could only operate using only one program at one time. The understanding that surrounds the development or creation of better and more advance computer and their operating system was to serve diverse needs of human being, organizations and the world at large.

What the first generation of computers could do is not the same when compared to the fourth generation is capable of accomplishing. Therefore, in order to address this need, researchers and scientist in the field of engineering and computer science forecast what the future would become as population of the world continues to growing and came up with more advance system with multiple operating system and programs.

Ben-Towim (2019) gave analogy of the various stages through which computer has evolved and they range in this manner. During the 1960s, the Bell labs invented initiated the UNIX, being the first to be created for multi-tasking and multi-user application required for functionality operating system. This led to having the first type of computer in the 70s, which is different from the common operating system used by

everyone. The concern here is that, the changes in the functions on the processor differs because the computer is an old one. The individual would have to setup the computer again for better function or operations even before the operating system could start all over. Several operating systems could be traced back to UNIX among Linux, Mac OS X, Android, iOS, and Chrome OS among others. In the year 1977, the Apple II series was invented to and this comprises of different home micro-computers designed by Steve Wozniak. It consists of 8-bit computer made up of several colour graphics. The innovative operating system was the read only memory (ROM), integrated on cassette.

In 1981, MS-DOS was introduced by Microsoft which became underway as the foundation of 86-DOS according to Seattle computer Products Company being produced by Tim Patterson. The MS-DOS was built within 6 weeks now commonly used by IBM personal computers. The next step has significant multi-tasking object-oriented operating system advanced to work like the NeXT computer formally used in the 80s and 90s. When Apple bought the NeXT, they decided to advance its look by the creation of macOS, IOS and WatchOS. Most of the features seen in Apple today are from NeXT. In 1987, OS/2 was launched. The OS/2 is a sequence of computer operating systems, which was initiated by Microsoft and IBM. In the year, 1990, Microsoft Windows produced Windows 3.0. Window 3.0 overtook Apple Macintosh and Commodore Amiga on GUI (Graphical user interface) front.

In 1991 September 17, Linux launched an operating system known as kernel having the features of UNIX open source of OS. Linux is known for its free access operating system that is commonly recognized like Ubuntu and its marketable use in relation to that of Redhat Hat enterprise Linux. Linux is one of the most prominent operating system for mainframe computers across the world. In 1992, April 22, to further buttress effort of Microsoft, Windows 3.1x was invented to showcase advance in a 16-bit operating setting. The Windows 3.1 has different improvement for the MS-DOS based on lifespan for the use of multimedia, system steadiness, workgroup interacting and accurate brand fonts. In 1995, Windows 95 was launched by Microsoft as the former operating system in the 9x household version after 1995 and 2000. The only variations that evolved were the 32-bit operating setting and its play structures and plug. By 1998, Microsoft continued in their quest to introduce Windows 98 that exhibited a hybrid 16 bit and 32-bit GUI, which brands it into a graphical operating system.

By 2008, iPhone OS 1 was initially iOS for Apple mobile operating system. Before now, there was no name given to the system. The iPhone contended diverse type of desktop operating system of MacOS now known as Mac OSX. Later when Apple expanded the iPhone software

development kit named the operating system as iPhone OS now iOS. The Android was released on 23 September 2008 as a way to improve on the operating system of computers. Android is also a mobile operating system established by Google. This was based on the idea associated with Linux Kernel and other open-source software. The android was intended specifically for touchscreen devices even though other versions of operating system are available. Android is in the category with IOS competitors. Windows 7 which is still in use by most individuals and organizations across the world today was created in October 22 2009 by Microsoft. The brain behind Windows 7 was to upgrade Windows Vista due to its reception, software compatibility and maintenance culture. New features were later added to it in order to expand its use for corporate bodies. By May 2011, Google developed Chrome operating system, which consist of Linux kernel-based operating system. The Google Chrome web browser due to its user interface has free software and provision on web application to accommodate broad users. The user data operates directly with the cloud that makes the operating system cloud based.

The understanding of all the mentioned types of operating systems that revolves round different computer applications indicate that, there is a broad and huge transformation that has taken place in the creation of these computer operating system across the world today. While looking at the future and expectation of man in line development, more expansion are likely going to evolve in the world of computer operating systems and their programs. Presently the computer operating systems discussed are artificial intelligence, robotics and blockchain and these might lead towards development of more operating systems for operation ability.

Some examples of early created computers ranging from one phase of development to another, which has the components of computer systems are presented below.

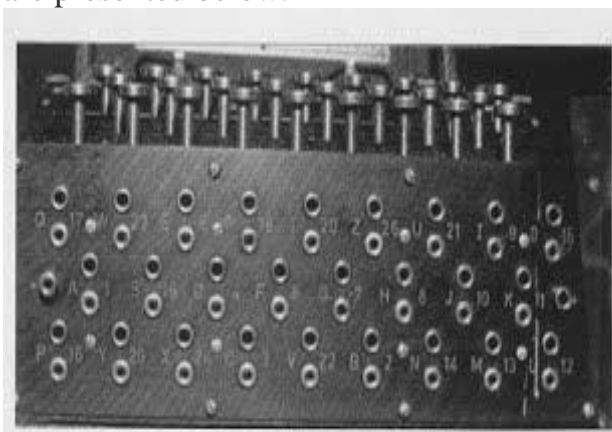


Fig 6: The First Generation (1940's to early 1950's)

<https://sites.google.com/site/optsvtms/history-of-operating-systems>



Fig 7: The Third Generation (1965-1980)

<https://sites.google.com/site/optsytns/history-of-operating-systems>



Fig 8: The Fourth Generation (1980-Present Day)

<https://sites.google.com/site/optsytns/history-of-operating-systems>

3.6 Types of Computer Operating System

Based on previous section on history discussed, it was established that, different types of computer operating system evolved in accommodation of purposes and task that require accomplishment. The essence of the various types of computer operating system was the changes of the economy across the globe and human unending desires. The various types of computer operating system according to Learn computer science (2021) cut across the followings:

- Single user single-tasking
- Single user multi-tasking
- Multi-processor
- Multi programming
- Real time
- Batch and parallel processing

- Distributed
- Embedded
- Network computer operating system

The aforementioned types of computer operating system are discussed below.

(i) Single user single tasking computer operating system: The single user single tasking computer operating system is a scenario where the computer system is planned or programmed to function in different modes in positions of available number of users functioning on the devices at equal time, total of procedures used, data management and the number of requests running concurrently on the same system. This might require the necessity to configure the system such that it will allow the operating system to support operations being carried out. In this regards, diverse categories of operating systems are made to support different methods of procedures.



Fig 9: Single user single tasking computer operating system

(ii) Single user multi-tasking computer operating session: The single user multi-tasking computer operating system permits more than one program that is being processed with the same program that is run simultaneously. In case the user is using the MS window computer operating system, he/she could open numerous MS word manuscript files at the same time. The single user multi-tasking computer operating system has the capability to apportion mutual processing resources with regards to what could be obtained in the central processing unit based on the same time of using the main memory RAM. When multi-tasking, only a single central processing unit is included but switches from one program to another is obtained such that, it might offer illusion of completing all the programs at once.

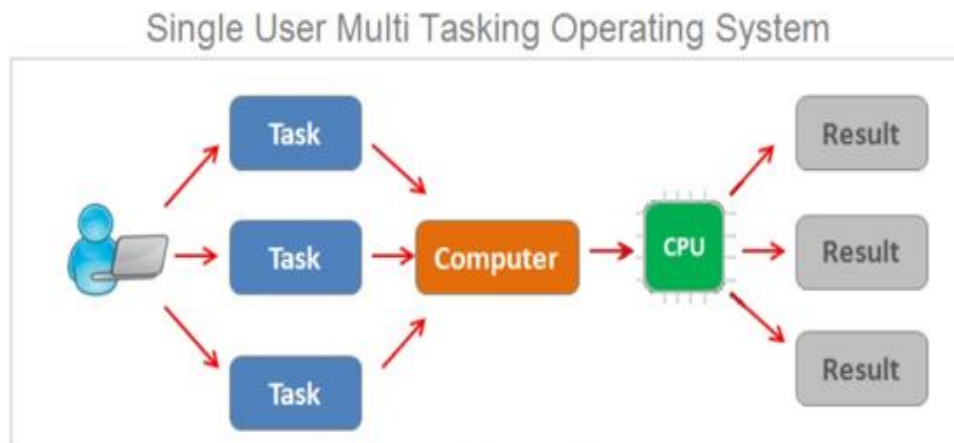


Fig 10: Single user multitasking computer operating system

(iii) Multi-processor processing computer operating system: The multi-processor processing computer operating system is designed such that, it uses additional processor in a particular system in order to improve the system routine. The different number of processors makes the system functionality considerably better-quality. Nevertheless, the processors are segmented into similar and collective main memory. Any computer that uses the multi-processor has the competency to support several programs accomplishment concurrently provided it is managed by a number of processors.

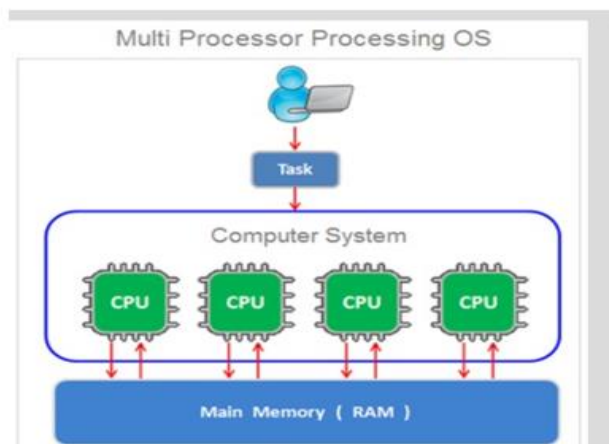


Fig 11: Multi processor processing computer operating system

(iv) Multi programming computer operating system: The multi programming encompasses a situation where two or more procedures of programs could be activated to function concurrently such that, the performance of the processes become faster using the same computer operating system. When this happens, it therefore means the task has be programmed one after the other. Usually when a program are running, the mode through which the operation occurs in the central processing

unit could open another program for use. This approach thus increases the use of system resources, so that the output of the system is enlarged. The reasons why the central processing unit could accommodate multi programming is the nature of its compatibility and operating system that enable it to carry all the task inputted in it.

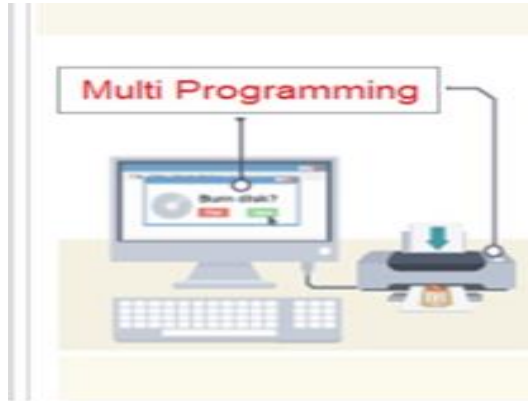


Fig 12: Multi programming computer operating system

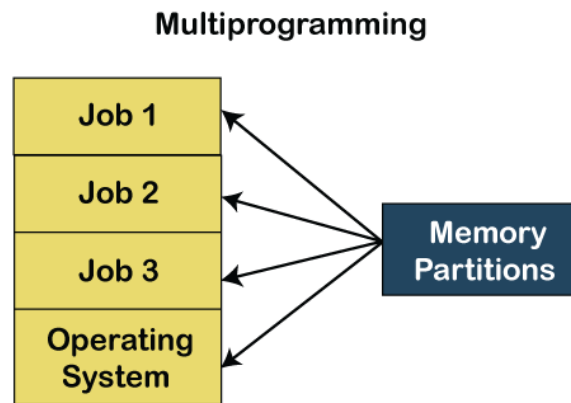


Fig 13: Multiprogramming computer operating system

(v) Real time computer operating system: The real time computer operating system which is also classified as the multitasking system is considered for factual time applications. There is the assurance that response within exact time boundary is possible and also appropriate for fast response of the system. The real time applications cut across embedded systems, industrial robots, and scientific research equipment among others. The real time application is very useful in military and space research. There is the assurance that detailed time boundaries and appropriateness are envisaged. There are different types of real time system and these cut across:

Types of real time computer operating system:

(i) Hard Real-Time System: The hard real time system is a type of system that are used by individuals mandated to have a broad and rigorous responsibilities inside a distinct period. When the response period becomes extraordinary, it becomes difficult for the system to accept it, as that may result to system catastrophe. The subordinate storage is limited or could be missing, since the system has stored much data in the read only memory as that is the case in a hard real-time system.

(ii) Soft Real-Time System: The soft real time system is different regarding a reduced amount of preventive system that could receive software and hardware resources due to the interruption associated with the operating system. In order words, the soft real-time system has the capability to criticize job arranged in less significant role. Although, the jobs in soft real time system are usually of importance due to the active nature of the system that must accomplish all task assigned to be done. Most importantly time boundary are programmed for different tasks which allows little period interruptions for additional jobs that are suitable for the system.

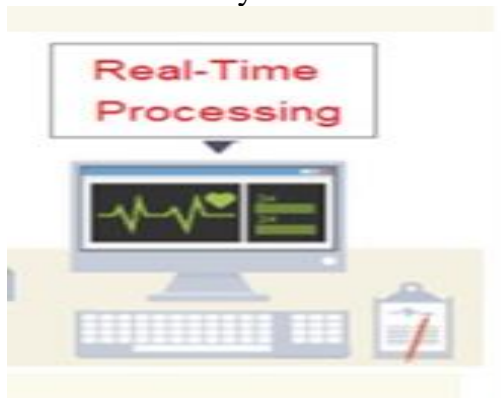


Fig 14: Real time processing computer operating system

(vi) Batch and parallel processing computer operating system: In the batch computer operating system, direct communication amongst operator and computer are not feasible. In order words, the operator needs to plan ahead of time such that the preparation of the task to be accomplish are set aside in offline mode in the form of punch card or paper tape or magnetic tape. When this has been done, it is given to the user or operator of the computer for sorting in order to generate related kinds of batches. The user of the system will then submit the collections into the central processing unit for accomplishment of the tasks one after the other. When the tasks are completed, the outputs are delivered by the operator.

(vii) Distributed computer operating system: In the batch computer operating system, direct communication amongst operator and computer are design separately between computational nodes. There is particular software made to interconnect with inclusive aggregate of the operating system. In order words, the operator needs to plan ahead of time such that the preparation of the task to be accomplish are set aside in offline mode in the form of punch card or paper tape or magnetic tape. When this happens the programmer could easily access the resources in that has be processed. There are additions of network that help the operating system expedite from top to bottom degree connectivity in order to link with other operators above the network.

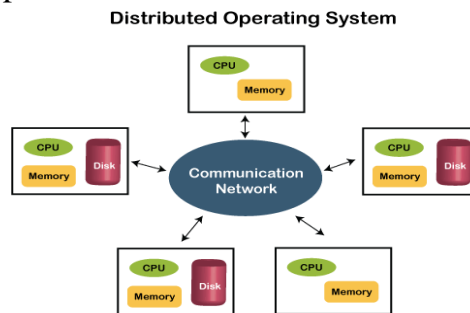


Fig 15: Distributed computer operating system

(viii) Embedded computer operating system: The embedded computer operating system showcases specific system meant for the functionality of the computer based on implanted hardware configuration. The embedded system is intended to operate on devoted devices such as the automated letter machines (ATMs), airplane systems, digital home assistants and internet of things (IoT).

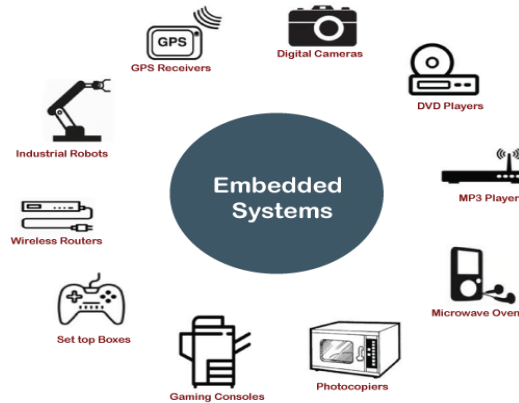


Fig 16: Embedded computer operating system

(ix) Network computer operating system: The network computer operating system operates applies certain strategies of the use of the server of network devices such as switch, router and firewall. The network support management of data, applications and additional system resources. They offer connectivity between independent operating system known as the network operating system. The network operating system is capable of consolidation of valuable share data,

records, hardware devices and printer resources between several processors in order to interconnect with other users.

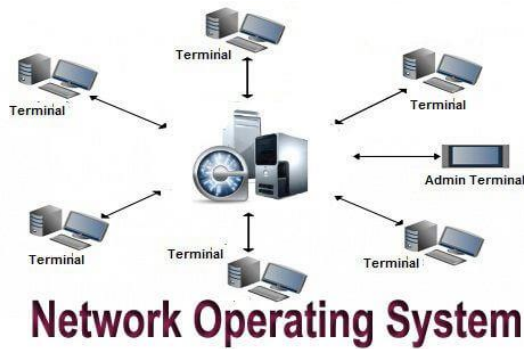


Fig 17: Network computer operating system

Types of network operating system:

(i) Peer-to-peer network operating system: The peer-to peer type of network permits operators to share documents, information, and files among several computer technologies that use the land areas network.

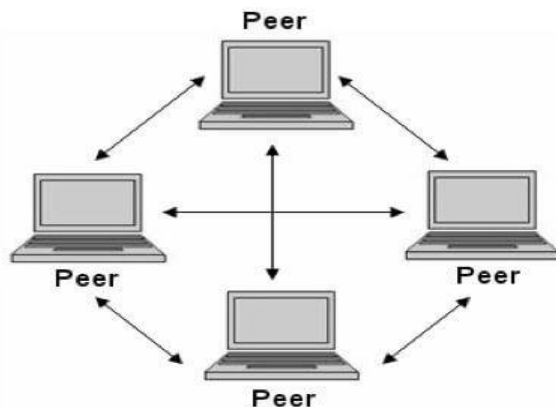


Fig 18: Peer to peer network computer operating system

(ii) Client-Server network operating system: This type of network operating system agrees to users' right to use resources, operations, and applications that surround the shared server of the information stored in the system. The client computer unit could access every information that are present within the central pivot of the network. Sometimes several users could access and distribute diverse information or data within the network across different geographical regions.

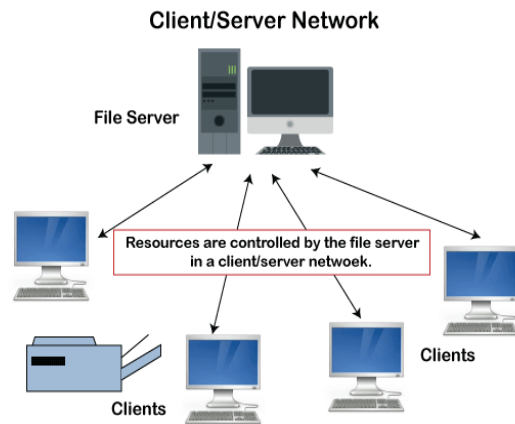


Fig 19: Clients/server network operating system

3.7 Unix Operating System

Unix Operating System is not different from the computer operating systems earlier discussed. It is an operating system developed with programs to support the computer or systems to function appropriately (Iowa State University of Science and Technology, 2021). The Unix operating system comprises a graphic user interface (GUI) that is similar to Microsoft Windows which provides easy-to-use workplace learning. The Unix is predominant among users of those working in engineering, scientific and academic institutions. The ability to use Unix requires adequate knowledge and skills of graphic programs, due to the features of multitasking and flexibility (Javatpoint, 2021). In Unix, most of what it involves is either a file or a process. The process consists of performing programs organization in a unique process identifier, while the file is a gathering of data and information which the users have created taking the form of text, report, and essay for editing and compilation.

3.8 History of Unix Operating System and its popularity

Unix Operating System was developed in the year 1960 (Iowa State University of Science and Technology, 2021). What necessitated the development of Unix operating systems was the joint developing experiment established by the Massachusetts Institute of Technology, AT&T Bell Labs, and General Electric. The essence was to develop an experiment of time-sharing operating systems called Multics for GE-645 mainframe. Since the development of Unix Operating System, constant changes have taken place, resulting to having more Unix with better functions in the computer system. The changes that evolved made the Unix Operating System to have a stable, multi-user, multi-tasking system for servers, desktops, and laptops. As the year progresses, Unix and Unix-like systems grew in popularity in the 1990s. The popularity that made Unix to become one of the outstanding operating systems of

choice for over 90% of the world population was the features of different programs embedded in it. The features help in stream worldwide networks (Iowa State University of Science and Technology, 2021).

3.9 Features of Unix Operating System

Unix operating systems has different characteristics. The characteristics or features comprises of multitasking, command structure, file security and protection, communication, accounting, Unix tools and utilities, open source, portable and multiuser. These can be represented in the image below.

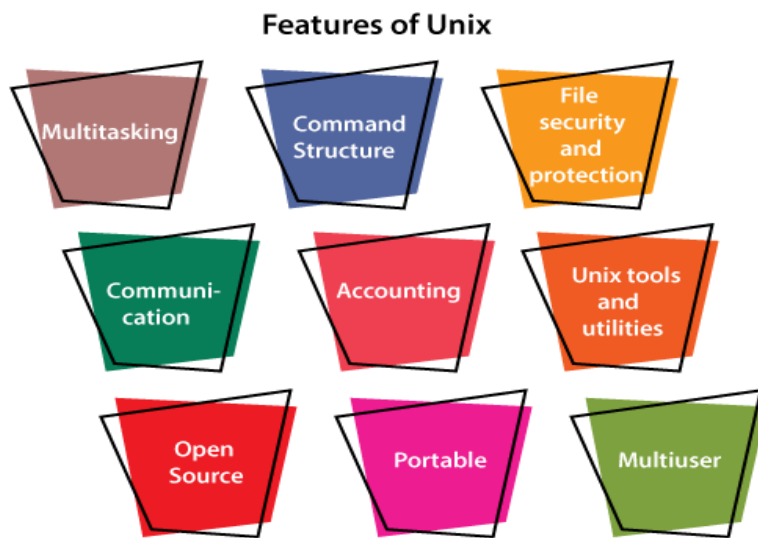


Fig 20: Features of Unix operating system

Another key factor to note with regards to the Unix features is the structure of Unix operating system, which form different layer, shown below.

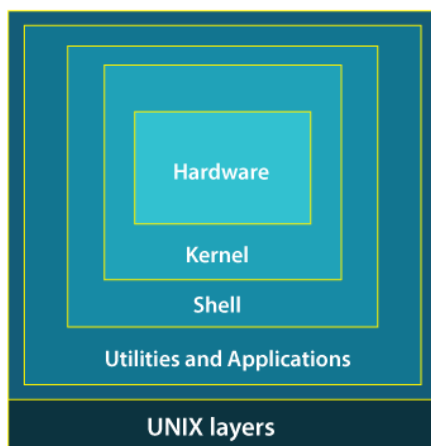


Fig 21: Layers of Unix operating system

With this in mind, the different layers in the Unix operating system afford communication within the computer hardware and the user. With the description of the Unix, most of the resources are hardware related. Other things which could be emphasized as regard the features of Unix is concerned are: UNIX is a multi-user system where different users could function, has multi-tasking platform, could provide a classified file structure for easy access and preservation of data. It has built-in networking functions, give access controls and security authentication.

3.10 Components of Unix Operating System

The components of the Unix operating system consist of the kernel, shell and the system program (Bhanu, 2021). The kernel, shell, and system program are simplified below.

- (i) **Kernel:** The kernel is the part of the operating system that interacts directly with the hardware of the computer. It helps every other device through which the kernel was built. The functions of the kernel are memory management, control access in the computer, maintaining files in the operating system, handling interruptions, errors, and inputs and outputs services. It also allocates the resources that need to be processed in the computer by the user.
- (ii) **Shell:** The shell is the software program that acts as mediator between the kernel and the user. It is meant to read the command and interrupts messages or communication sent for execution. The function of the shell comprises of opening of the file, writing file, obtain information concerning the file, carry out the execution of programs, terminate a process, changing the priority of processes as well as the time and date for execution of the task.
- (iii) **The system programs:** The system programs have to do with programs that execute any given applications. For instance, emacs editor, StarOffice, xv image viewer, g++ compiler etc.

3.11 Basic Operations of Unix

Since Unix operating systems has established programs that form a connection between the computer and the user. The computer programs therefore assign the system resources and organize all particulars within the computer's kernel. Therefore, the basic OS carries out the following activities, namely, optimization of resources management, memory management, process management. Other things which could be associated with the basic operation in Unix are command description of task, files and directories, file management, confirm system status, navigate within the systems and system maintenance.

3.11.1 Microsoft DOS: MS-DOS is known as the Microsoft disk operating systems which allow users to pilot, open and operate the computer to process task. The task shows different files on the computer-based of line given instead of GUI Windows. Presently, MS-DOS are not used that much, due to more recent operating systems that are in existence. Nevertheless, the knowledge of the shell in the systems are more commonly known as the Windows command line as used by numerous operators (Gcreddy, 2022). The MS-DOS uses a non-graphic command which was derived for the operating systems for IBM-compatible computers. The most prevalent Microsoft windows used now is that of Window 10 due to the features that are embedded in it.

3.11.2 Windows Operating Systems: The Microsoft Windows, usually mentioned as Windows, is a collection of numerous branded graphic operational classifications of systems within the same families. These are all technologically advanced and advertised by Microsoft. They allow the user to accomplish several task garbage in, garbage out. The Window makes it possible for a wide-range activities of all types to be completed within a short period. For instance, a user could browse the Internet, email, edit digital photos, listen to music, play games, and do much more using the same windows. This results to the features associated with the latest windows used my many individuals and organization today (Goodwill Community Foundation, 2021). Some of the different windows created thus far are Windows 10 S (2017), Windows 10 (2015) - MS Version 6.4, Windows 8/8.1 (2012-2013) - MS Version 6.2/6.3, Windows 7 (2009) - MS Version 6.1, Windows Vista (2006) - MS Version 6.0, Windows XP (2001) - MS Version 5.1, Windows 2000 (2000) - MS Version 5.0 (Goodwill Community Foundation, 2021).

3.11.3 Mac OS: MacOS is a branded graphic operating system established and advertised by Apple since 2001. It is the primary operating system for Apple's Mac. There are several macOS version namely, macOS 10.12: Sierra (Fuji) - 20 September 2016, OS X 10.11: El Capitan (Gala) - 30 September 2015, OS X 10.10: Yosemite (Syrah) - 16 October 2014, OS X 10.9 Mavericks (Cabernet) - 22 October 2013, OS X 10.8 Mountain Lion (Zinfandel) - 25 July 2012, OS X 10.7 Lion (Barolo) - 20 July 2011, OS X 10.6 Snow Leopard - 28 August 2009, OS X 10.5 Leopard (Chablis) - 26 October 2007, OS X 10.4.4 Tiger (Chardonnay), OS X 10.4 Tiger (Merlot) - 29 April 2005, OS X 10.3 Panther (Pinot) - 24 October 2003, OS X 10.2: Jaguar - 24 August 2002, OS X 10.1: Puma - 25 September 2001, OS X 10.0: Cheetah - 24 March 2001 (Haslam, 2021).

3.11.4 Linux: Linux is an operating system that is so prevalent globally. Android, is power-driven by the Linux operating system. This operating

system is the software that bring about the functions of the hardware resources stored in the computer desktop or laptop. The software accomplishes the transactions of the communicable tasks in the hardware (The Linus Foundation, 2022). Linux was developed in the mid-1990s and spans across the globe. Linux is essentially everywhere. It can be found in your phones, thermostats, cars, refrigerators, home appliances, Roku devices, and televisions (The Linus Foundation, 2022). It is used to individuals and organisation to operate the Internet, supercomputers, and world's stock exchanges.

3.11.5 Solaris: Solaris is a registered Unix operating system initially advanced by Sun Microsystems. It outdated the corporation's previous SunOS in 1993. In 2010, after the Sun procurement by Oracle, it was retitled Oracle Solaris. Solaris, a Latin word meaning "relating to the sun", may refer to: Solaris (operating system) Solaris is a Unix operating system originally developed by Sun Microsystems. Solaris is a Unix that has the same features as DTrace, ZFS and Time Slider (Word finder, 2022).

3.11.6 Android Operating System: The Android operating system consist of a mobile operating system established by Google (GOOGL) to be mainly used for touch screen strategies, of cell phones, and tablets. The plans were for users to operate the mobile devices instinctively, with their finger actions such that, mutual signs of pinching, lifting, and tapping could take place. Google has now employed Android software in televisions, cars, and wristwatches, being tailored towards a unique user interface (Chen and Catalano, 2021).

3.11.7 Open-Source Operating Systems in Libraries: Open-source software is a software that is made free of charge for individuals and libraries, such that, since the individual and libraries could not pay or purchase any software, could use it to run their system, copy, distribute, study, change and share information and knowledge to meet their different information needs and purposes. Open-source library software's do not require the cost of commercial software but allows libraries to have better regulator over their employed staff and resources in their environment (Houser, 2009).

4.0 SUMMARY

This unit examined the overview, concept, objectives, features, history, types of computer operating system, Unix operating system: history of Unix operating system and its popularity, features of Unix operating system, component of Unix operating system, and basic operations of Unix . The rationale behind it was changes that has evolved in the

workplace learning where individual have to continually make use of the computer to render service for organizational transformation. Presently, there is no organizations including libraries and information centres that could meet up with diversities of users' information and at the same time attend to other of their goals and objectives without the support and use of computer operating systems. Computer operating system is significant to diverse set of work operations globally, even though some individuals in some institutions/organizations and developing countries are still struggling to find foot with its use. This makes it possible that present economic state which is associated with digital technologies expect that every individual irrespective of race and class should be familiar with this ever-needed computer operating system.

The idea surrounding computer operating system is that, the computer is perceived as automated or electronic devices consist of different operating system, else it could be seen as empty frame. Extant literature search shows that, the operating system takes into account of the aptitude of handling the computer memory within the hardware devices. The operating system is continuous based on the software that drives the different programs that runs in the system. The determination exerted into the operating system allows the computer to receive data and information for appropriate management before it drives through rigorous renovating and handling of useful information and knowledge which the users operate with. The hardware and the software, though cannot function on them without the keyboard and mouse that aids to input data or information in the computer. There are other components that support the functionality of the computer such as the monitors, printers, speakers, hard drives, flash disks, router among others.

The understanding obtains from extant literature indicate that, there is no worldwide accepted definitions of computer operating system, because most of the scholars who have written so much in these areas comes from different background. Certain similarity thrives in the various interpretations and definitions given thus far. The computer operating systems are vivacious apparatuses that provide for diverse work operations either at home, schools and workplace learning. The operating system is an organized system principally designed for the running of applications in the computer system. The essence of the computer operating system could result to widen diverse fields of study. There are many services delivery across diverse fields of study today that require the use of the computer operating system, to ease the effort which man must put in into work operations. The computer may possibly complete not the same task from accepting data (input), to the stage of handling the data through arithmetic and logical analysis, before it produces the output commencing from the processing, thereafter stores the outcomes for future use. The competence of the user of the

computer is centered on ability to transport different jobs required to be executed.

The computer operating system has different objectives for which they were created and this consists of the following: usability, computer languages, resources manager, maintenance culture, multi-programmed batch systems, time sharing system, convenience, efficiency, concept of hardware parts, management of the system resources, hardware generating construct, permit resources to be managed, provision of effective user interface, user friendliness, use program development, expansion of illustration within program control, has protection measures and supervision mode, permit disk admittance to different file system, influences the system for diversion of operations, error discovery and control, distribution of resources, memory management, and program implementation among too numerous to mention. The history of computer system is compounded with the entity that has long existed for over eight decades, between 1936 and 1938, when Z1 was created. The first computer system uses one program at a given time. Progressively, additional software programs were incorporated into the system that shaped improved chance for the start of operating system we now use today. The code used in most of the computer today makes it much more advance to successfully accomplish task when utilized by the user.

What the first generation of computer could do is not the same when compared to the fourth generation is capable of achieving. Therefore, in order to address this need, researchers and scientist in the field of engineering and computer science forecast what the future would become as population of the world continues to growing and came up with more advance system with multiple operating system and programs. The genealogy of computer creation follows this order apart from what was earlier said in 1936 and 1938. In 1981, MS-DOS was introduced by Microsoft which became underway as the foundation of 86-DOS used by many people and company today. In 1987, OS/2 was launched, in 1990, Microsoft Windows produced Windows 3.0. Window 3.0 overtook Apple Macintosh and Commodore Amiga on GUI (Graphical user interface) front. In 1991, Linux was launched with known kernel. In 1992, effort was exerted on Microsoft, Windows 3. In 1995, Windows 95 was launched by Microsoft, in 1998, Microsoft continued in their quest to introduce Windows 98 that exhibited a hybrid 16 bit and 32-bit GUI, which brands it into a graphical operating system. In 2008, iPhone OS 1 was originally iOS for Apple mobile operating system. In 2011, Google developed Chrome operating system, which consist of Linux kernel-based operating system. The Google Chrome web browser due to its user interface has free software and provision on web application to accommodate broad users. The user data operates directly with the cloud that makes the operating system cloud based.

The thoughtfulness of all the mentioned types of operating systems revolves round different computer applications. There is vast alteration that has taken place in the conception of this computer operating system across the world today. Currently the computer operating systems deliberated on are artificial intelligence, robotics and blockchain and these could lead towards development of more operating systems for operation ability. The creation of this operating system gave birth to different types of computer operating system used by individuals today and these comprises of the followings:

- 2Single user single tasking
- Single user multi-tasking
- Multi-processor
- Multi programming
- Real time
- Batch and parallel processing
- Distributed
- Embedded
- Network computer operating system (peer-to-peer network operating system and client-Server network operating system)

5.0 CONCLUSION

The concept and capability surrounding computer operating system has made it an indispensable tool which no individual and organizations could do away with in present day information and knowledge economy. The computer operating systems play important role in the accomplishment of the goal of library and information science profession in general and related institutions. The objectives, features, history and types of computer operating working together as affirmation of why it was established or developed.

Self – Assignment Exercise

Identify fives reasons why computer operating system is essential in present day libraries and information centres?

6.0 TUTOR-MARKED ASSIGNMENT

Considering the inevitable entity associated with computer operating system used by individuals in all sphere of human endeavours, the following questions would help students to develop themselves further in advancing what they have learned.

1. What do you understand computer operating system?
2. What importance does it have to individuals and libraries and information centres?

4. Relate why and how the history of computer operating system is synonymous to five laws of Ranganathan in the business of continuous service delivery?
5. What implication does the computer operating system services have to individuals and libraries and information centres
6. Explain the meaning and history of Unix Operating systems
7. What are features, component, and basic operations of Unix Operating systems

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UNIT 2 FUNCTION, PROCESSES, TECHNIQUES, COMPONENTS AND POLICY OF COMPUTER OPERATING SYSTEM

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Functions of Computer Operating System
 - 3.2 Processes of Computer Operating System
 - 3.3 Techniques of Computer Operating System
 - 3.4 Components of Computer Operating System
 - 3.5 Policy of Computer Operating System
- 4.0 Summary
- 5.0 Conclusion
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

In module 1, unit 1, issues related to overview, concept, objectives, features, history and types of computer operating system were considered in different dimension. In this present module 1, unit 2, we shall dwell on the function, processes, techniques, components and policy of computer operating system. The rationale towards this analogy was to give the give students broaden scope that surrounds how the computer operating systems is developed and function as well. Without this analogy, it become difficult to understand the direction where the module is going.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this study unit, students should be able to understand:

1. The functionality and capability that surrounds computer operating system
2. The processes involved on how to use and apply computer operating system
3. Recall and discuss the components which the computer operating system is made up of
4. Understand the policy that guide the purchase of computer operating, use and maintenance

3.0 MAIN CONTENT

3.1 Functions of Computer Operating System

Computer operating system has become so significant in present day workplace learning and among individuals in accomplishment of set goals. There are various purposes in work operations, for which computer operating systems are made. The various functions of computer operating systems are: (i) help to achieve computer resources of central processing unit, memory disk drives and printers, (ii) create a user interface, (iii) perform and deliver services for application software, (iv) file and memory management, (v) handle input and output and control peripheral devices. These has made it possible for continuous access of the operating system to accomplish several functions/activities by users. To enhance quality service delivery of the operating system, the software and hardware serves as backbone to the computer. An example of the representation of the functions of the operating system in the computer is shown in fig 22 and 23 below.

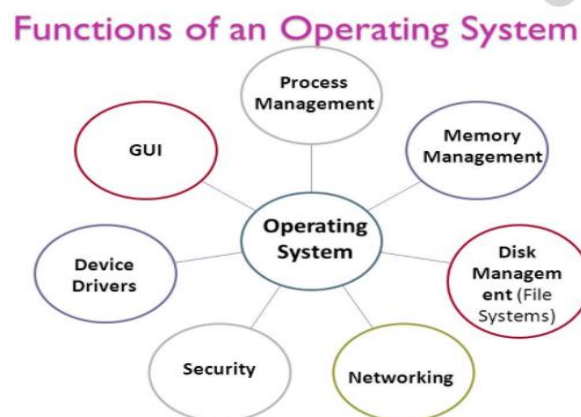


Fig 22: Function of computer operating system



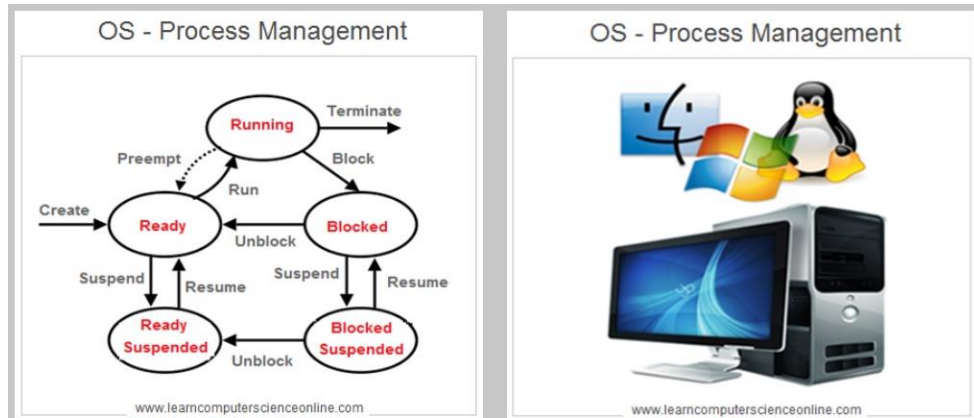
Fig 23: Computer operating system

As indicated by Learn Computer Science (n.d), most outstanding functions which the computer operating system are used for in any workplace and among individuals are mentioned below.

- Process management
- Memory management
- Resource management
- Security management
- Command Interpreter
- File management

Learn Computer Science (n.d), emphasizes on how the various functionality in computer operating system are carried out based on programmed activities.

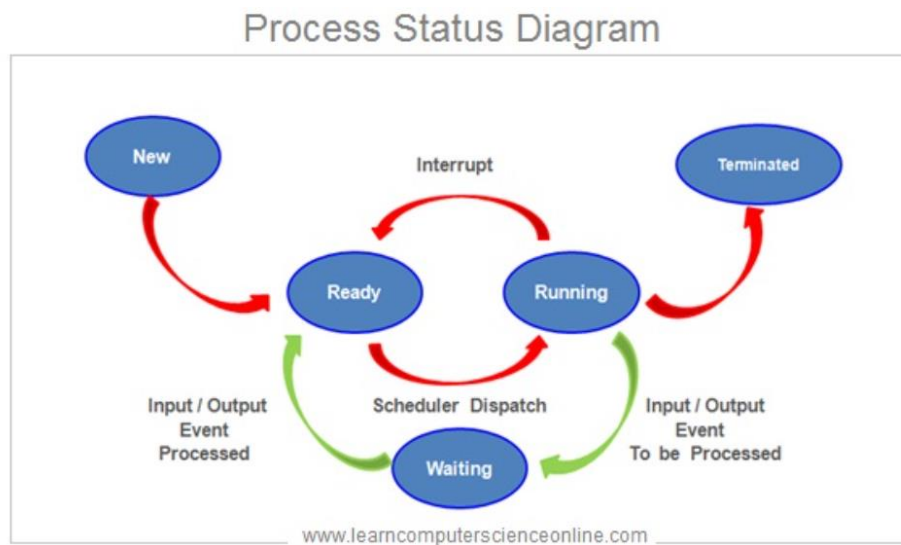
(i) Process management: By process management, we refer to computer program that are performed. There are varieties of number of program commands in the computer. When program is to be executed, the operating systems assigns facilities that are to carry out the operations and thereafter the central processing unit begins the implementation of the program commands. In the process management in computer operating system, the operations of the computer cover overall work of multi-tasking, such that, the users concurrently open two or more MS Word document, and as well as a web page browser. The web page browser or MS Word documents that are opened signifies a process. Through the support of the operating system, program which needs to be carried out are inputted into the main memory of random-access memory. This means that the functions of the process management in the computer operating system give room for users to handle several tasks of MS Word documents and web browser concurrently. The process management operations are responsible in managing different processes when the user has program the application to be used to run the system. Such activities of multi-tasking where users' switches from one program to another in the central processing unit could be regarded of process management. It is believed that, under normal circumstance carrying out of activities in the central processing unit follow a sequence of one after the other but when the service of program to render are much, there are creation of several running operations simultaneously.



<https://www.learncomputerscienceonline.com/operating-system/>

Fig 24: Process management computer operating system

The process management diagram indicates vital functionality which the operating system helps in handling the central processing unit when performance of jobs has been programmed. This follows one sequential order to another in the process of inputting data or information that needs to be processed. The process management helps with the processes of documents that have been inputted into the systems.



<https://www.learncomputerscienceonline.com/operating-system/>

Fig 25: Process status diagram computer operating system

(ii) Memory management: By the memory management, we refer to the controlling of the major or core memory of the computer operating system. The key memory does every operation which are inputted into the system. The operating system takes record of all the key activities in the main memory, that has been inputted in it. The tasks of processing information or documents are structured in multi-programming way, such that, the operating system selects which procedure to follow first, with the memory, at what time and by what method of it, in allocating the requirements which needs to be processed. The system memory is

very crucial in any computer operating system considering the functionalities carried out on daily basis in organizations. The operations that take place at the memory management differs from one individual to another, based on the task given to the system to handle and the main type of the memory is the virtual memory represented below.

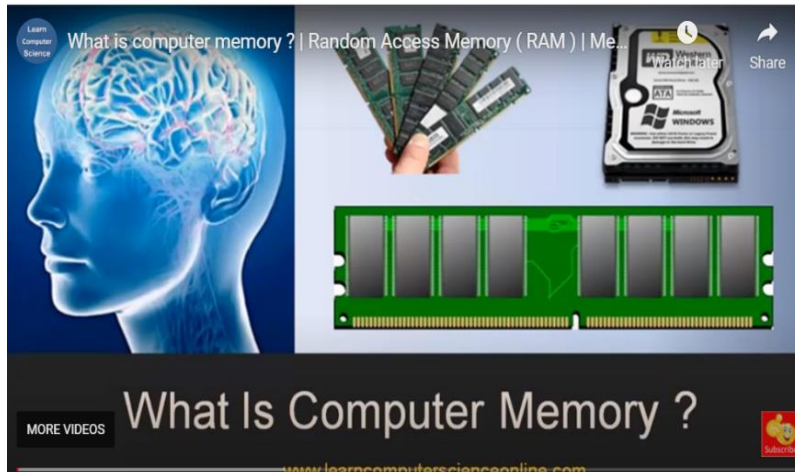


Fig 26: Memory management computer operating system

Type of memory:

(i) Virtual memory: Virtual memory is one among other memory that occur as the main storage thus resulting to transfer of data and information to other secondary storage. The virtual memory has diverse types of memory that has been organized in classified order. Each of the memory does particular functions and optimally used by the operating system for the period of numerous phases of program accomplishment. The virtual memory is sensitive tool that permits the operating system to use some percentage of the floppy memory known as the subordinate memory. The subordinate memory is a memory that helps to interpret different subordinate structure based on emphasizes made during interaction of the systems. It has a reasonable addition to the key system memory, thus permitting implementation of programs on accessible magnitude of the random-access memory. The random-access memory is a computer memory that can be read and at the same time changed in any order, which is used for storing data and information in machine code.

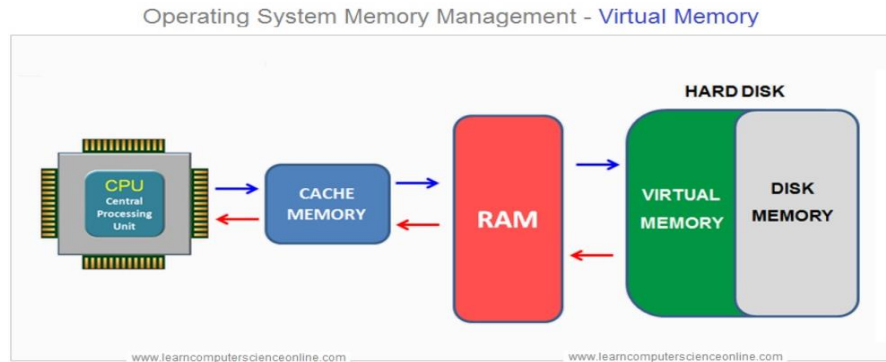
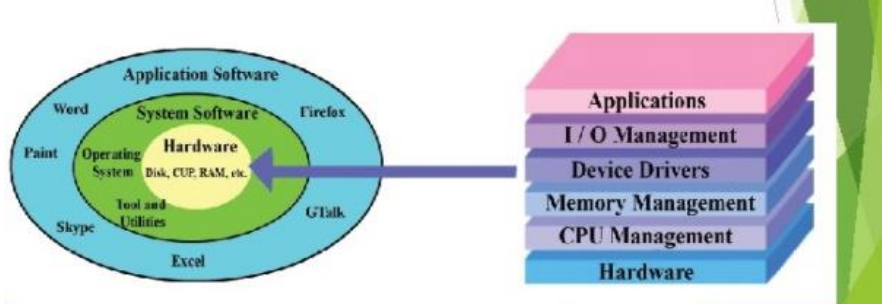


Fig 27: Virtual Memory computer operating system

(iii) Resource management: Resource management refers to the management of diverse resources. The different resources are human, material and financial resources. These are fundamental in the operations of computer operating systems. For computer operating systems to be functional, human being is required, material cannot be avoided and finance is needed to purchase and maintain the systems. Resource management has a lot of roles to play in the function of computer operating system. In most organizations/institutions, business world and individuals, resource management encompasses diverse connotation of human, material and financial. The three variables of human, materials and financial are fundamental in accomplishment of set goals in any workplace learning. The overall understanding of resource management in relation to computer operating system is embedded on the core system memory of random-access memory, storing space and the workstation progression time. In the resource management operations, the central processing unit initiate the program implementation when the operating system input the task to be carried out into the core system called the random-access memory. In this regard, the required memory that would enable the system carry out the operations is allocated based on time slot which would take the central processing unit to process the job. In this case, the difficult task is being held based on the distribution and division of the resources to be processed from the successively diverse phases of performance in the systems.

Resource management activities such as allocation of CPU time, allocation of memory, and allocation of input output devices of each process are managed under the resource management of Operating System.



<https://slidetodoc.com/information-and-communication-technology-ict-grade-12-operating/>

Fig 28: Resource management computer operating system

(iv) Security management: By security management, we imply applying preventive measures to data and information in the system. This would prevent anyone from having access to the valuable data and information in the system. The security management function ensures information of any individual or organization are not given access to people without authorization or public domain due to how vital those information and documents are to the organization. The essence of this is to safeguard the entire operations that have been made over a long period of time in the computer operating system. unauthorized individual has access to those information or documents, it could cause a lot of damage to the individual or organization By now students will understand that everything about computer operating system is crucial. People have shown to be dubious and evil hence the need to safeguard against unauthorized access. This result to how vital the data and information is used for decision making and planning in the organization. The stored data or information are usually Encrypted in the computer system. The operating system have control over the entire resources stored in the system. The safety and protection offered by the operating system covers the various application and system processes. In order to have a firm protection and security of the computer operating system, different security measures of password and use of thumbprint and Iris are crucial considering latest technologies that also have a way of detecting and hacking into system both in the organization and on the internet.



Fig 29: Security management computer operating system

(v) Command Interpreter: The command interpreter is one among other components that aids to read commands specified by the user of the system. The command interpreter relates the commands into viewpoint before it follows the implementation of task carried out. The command interpreter form part of the computer operating system which helps understands the implementation of guidelines that go into the system through interactive measures as directed by the user. The application program cannot function properly without the command interpreter helping to give guidance of what to be done by the user. The command interpreter is a mediator within user and the computer.

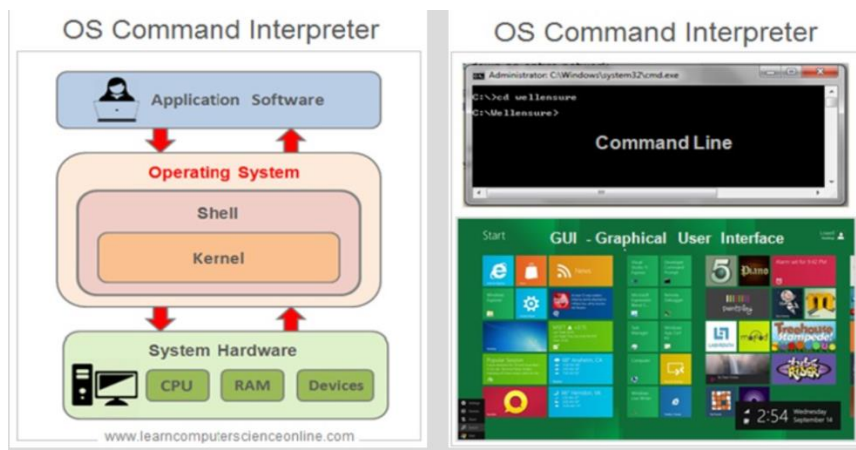


Fig 30: Command interpreter computer operating system

(vi) File management: A file is a combination of assortments of related information. This could be categorized into text, images, audio, video, and other data and information that are put together. The file management is one the most significant structures of the computer system that is accountable in handling all files and documents stored in the system. There are diverse implementations of activities or task that

are carried out in the computer operating system which must be managed in order to have an organized file system. All the processed information and data are usually stored in the central processing unit which could be harnessed by the user of the system for different purposes. Without file management in computer operating system, none of the stored information and data represented in text, images, audio, and video could be accessed by the user or any individual operating the system. It is most crucial to take consideration to file management as it would help to bring longevity to the processed and stored information and data.

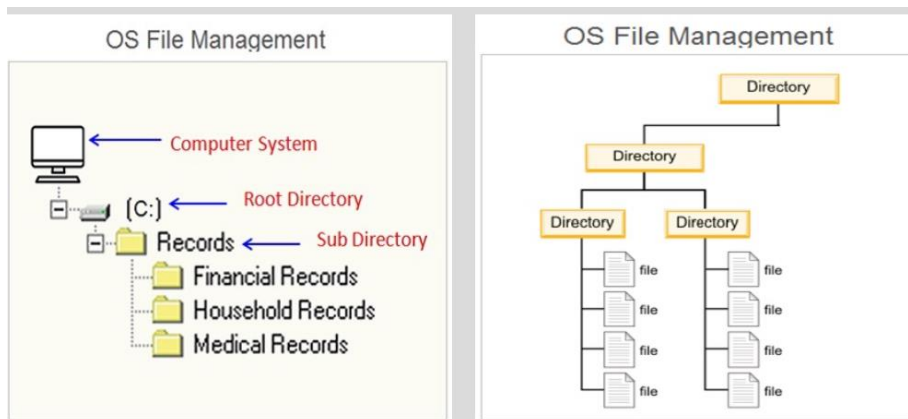


Fig 31: File management computer operating system

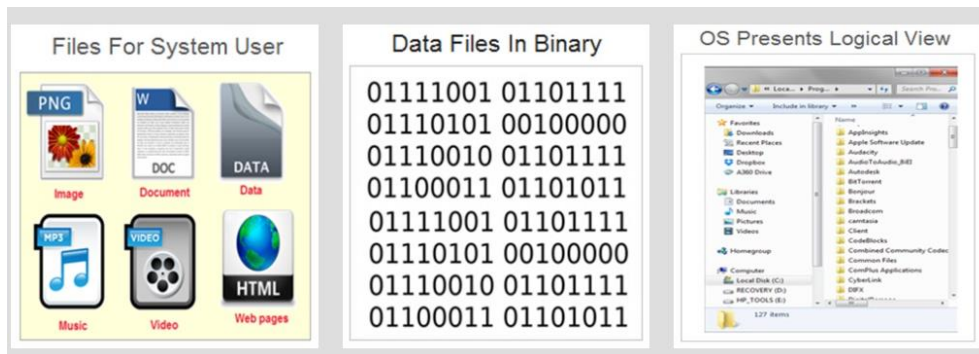


Fig 32: Other forms of files system computer operating system

In the same vein, Hussain (2017) notes on the various functions of computer operating system which cut across the followings:

- Dependable background for software implementation and instructions
- Communicable flow and workstation
- Diverse use of hardware resources
- Relationship among users and hardware
- Organization of hardware mechanisms
- Provision of location for software functionalities
- Provision of data managing

- Monitoring of system functionality
- Availability of marketable operating system
- Various software compatibility

3.2 Processes of Computer Operating System

The processes involved in computer operating system varies from one user to another and in different environment with purposes for which the computer system is being utilised. When considering the use of computer operating system, the execution of task are the main points of emphases. There are some computer operating system that may process task or jobs speedily, for example, batch operating system, multitasking, distributed and networked operating, just to mention a few. These works with the commands or programs that runs the system. There are some that are of new version compared to others as well. But above all, the task must be carried out judiciously such that the purpose of use and acquisition is not worthless.

Tutorials point (n.d) notes that, a process has to do with variants of package of Java, Ms words, excel, coral draw, database management systems, needs accomplishment in the computer system. In order for program to be performed, it must follow one process of sequential order even though the tasks are numerous. What this mean is that, when computer programs are written in a manuscript dossier before the implementation is carried out, it showcases what a process is all about. Meanwhile the process of inputting different program into the system to be processed by the memory has also generated some challenges if the programs in the system are not well programmed according to the operating system. Different computer with different users and programs, helps with the advance implementation passes, that is, from one end to another using diverse stages before considering the ranges of the operating system. The stages followed during implementation phase are shown below:

- Start
- Ready
- Running
- Waiting
- Terminated or exit

The aforementioned is simplified for better understanding and interpretation:

(i) Start: The stage of the start has to do with the opening position before the procedure is on the go or generated.

(ii) Ready: In the ready stage, the process goes ahead of the allotted task to be processed by the operating system in the processor. The ready

procedures wait to take the processor apportioned just before relating it to the operating system such that, the task can become easy to function in the system. If that is not done, the progression might not originate straight from the position of the start stage where the system processed documents from. Sometimes, despite the fact that the running system is in order, there might still be some interruption by the central processing unit as noticed by some processor.

(iii) Running: In the running stage, after the procedure has been situated to the processor based on the operating system used, the user ensure that, the progression state is fixed to the administration of the processor that performs the directives.

(iv) Waiting: During the waiting phase, the development interchanges into the waiting state even if the needs to wait for any task become essential. Such waiting for user directives to input the task or information or documents becomes important in order to verify and checking for appropriateness.

(v) Completed or exit: The stage of completed and exit is the last phase considered when the task or activities has been processed. It implies the implementation of the process is already covered, as such it could be terminated or you exit from the computer operating system. This means that when the activities have been completed in the main memory, it is terminated by the operating system where it is later moves or removed from the main memory.



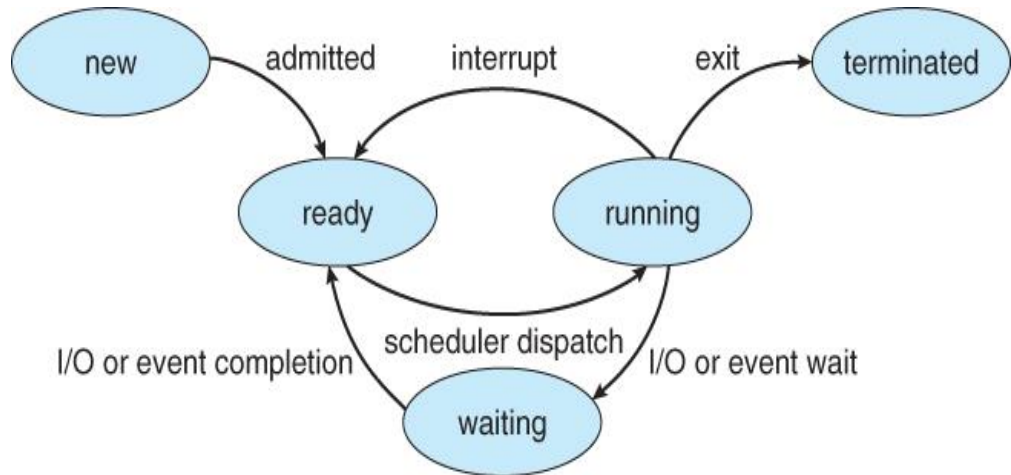


Fig 33: Process of computer operating system

The diagram below indicates where different task switches to and from, in one phase to another in the central processing unit. This gives you an overview of how the processes of task are programmed in the system.

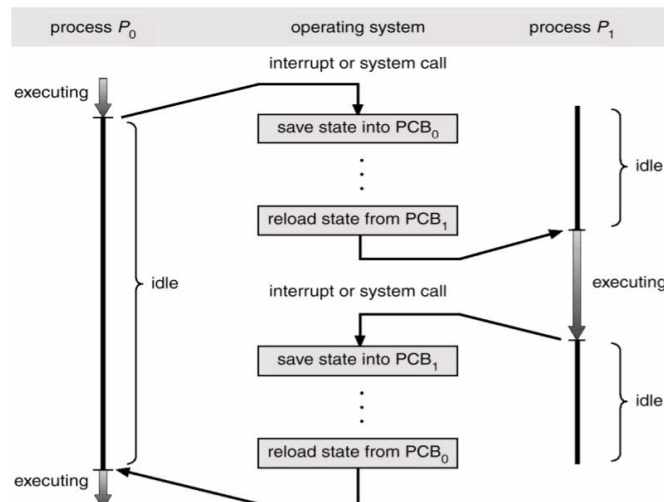


Fig 34: Switches in central processing unit

3.3 Techniques of Computer Operating System

The techniques involved in computer operating system refers to scheduling, policies, multitasking, polling, interruption, virtual memory, that uses different applications in the operating system. Bunt (2000) refers to the followings as fundamental associated with operating system among individuals and organizations. The techniques that could promote or enhance computer operating system:

- Users' awareness
- Time allocation:
- Training and re-training
- Upgrade of system

- Job organization
- Cost of system maintenance

The techniques of computer operating system which are further discussed below were based on Bunt (2000) analogy:

(i) Users' awareness: User's awareness is one of the main techniques for proper use of the computer operating system. In order for user to make use of the system or computer, they must have had prior knowledge of the technical know-how and become more familiar with the entirety of the computer, otherwise it becomes a challenge for them. The awareness refers to what the computer operating system is made up of and ways of how to operate it. Switching the system on does not implies such individual knows how to make use of it. It is far much more than that. Users' awareness also involves embarking on some level of education where the user is exposed to basic understanding even though the manual is available after the system has been purchased. This would assist the user on what to know, do and even when there are slight problems with the system itself. There are so many individuals who claim to have awareness of the use of the system but when given any task, find it difficult to execute such task as directed with the use of the system. Students needs to be active in practice in order to acquire more knowledge and information in the use of systems. With the use of the system, allocation of task or resources in the system to when it is stored in the central processing unit becomes easy. Users' awareness showcase that the user is in direct control of all activities as far the system is concerned. The approaches to follow on the right languages is to know how to use the inputted data and information in the system.

(ii) Time allocation: Time allocation implies the apportioned time frame which is required for each processing task to be executed. When data and or information are inputted into the system, there is certain time frame which it will take the processing to be completed. For example, a user or student who wants to type ten (10) thousand words of written assignment or article, there is no way it would be completed within one (1) hour. Therefore, the document or assignment to be processed can now be determine by the user or student on how long it will take him/her to complete such task. When this is done, though depending on the efficiency and effectiveness of the system and the user skills, time could now be allotted to when exactly the job could be completed. This makes it imperative for time allocation essential in any given task; otherwise, people could spend too much time in one given task. Time allocation helps to bring efficiency and effectiveness in any work organization and by individuals. It is crucial to note that, every system needs time for each workstation that requires execution. This would help improve early completion of task. Although several techniques has resulted in the

processing of more than one task based on the scheduling apportion to them and this has been computer-generated, that has been examined accurately, and regularly executed in most genuine systems.

(iii) Training and re-training: Based on the two factors mentioned above, it is fundamental for individuals and users to embark on training and retraining in computer operating system. The justification behind this assertion is that, computer operating system has shown to become more evolving and complex due to development and divergence of eruption of newer technologies with multifarious software and programs embedded in them across the globe. Training and retraining imply the act of engaging in further education of acquisition of knowledge and skills required for advancement of work operations. Training and retraining have become a technique that can be used in computer operating system to showcase exposition to adding value to ones' knowledge based on task that require administration. The acquisition of new knowledge and skills with the application of operating system cannot be undermined in present day digital technology era. It is essential to note that, training and retraining becomes a technique through which users of system are more familiar and rooted in its application considering the wave of technologies and best practices in workplace learning.

As students, studying towards acquisition of their degree, there is no way they could do away with training and retraining since the use of computer system is mandatory in every task given to them at the university or any higher institution of learning. This means that, irrespective of the category of individual, training and retraining should be taken seriously by users of system and students amidst other folks who uses computers. It is the level of knowledge and skills which users has that would determine decision to be made in processing of task inputted in computer operating system.

Upgrading system: Computer operating system has become so diverse in recent times such that, as changes in their use evolves, it is important they should be upgraded to the newer version as this would help to facilitate services which the system would render to the user. For example, take a look at the following computer operating system below.

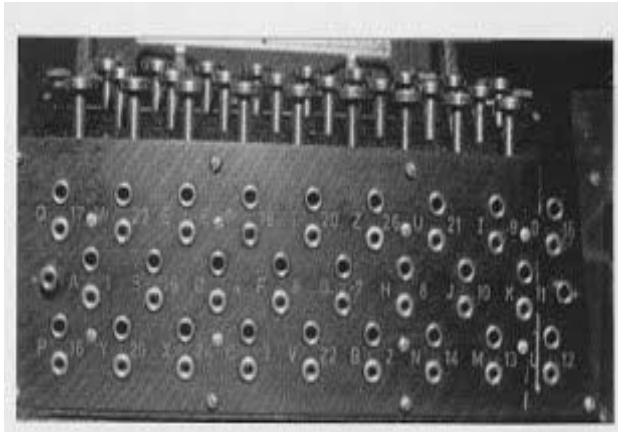


Fig 35: The First Generation (1940's to early 1950's)

<https://sites.google.com/site/optsytns/history-of-operating-systems>



Fig 36: The Third Generation (1965-1980)

<https://sites.google.com/site/optsytns/history-of-operating-systems>



Fig 37: The Fourth Generation (1980-Present Day)

<https://sites.google.com/site/optsytns/history-of-operating-systems>

Then iPhone OS, artificial intelligence, robotics and blockchain, being the latest technologies in use in most developed world today, even though it is at its infancy in some developing nations. There is no way

someone could quantify the capacity and software associated with the first generation and fourth generation computer to present day twenty first century, based on how efficient and effective when adequately utilized. There is the assurance that, as life changes and development of technologies increases, in the next few years to come, most of the iPhone OS, artificial intelligence, robotics and blockchain would have been overtaken by events and better newer technologies erupts. Therefore, in light of the above, upgrade of our system is very important. This could also be seen from when we started using Nokia 33 and today, we are using smart phones. Upgrade of system help us to forget about old things and start using new things which is the case with us as humans. The more we grow older we throw away our old clothes and want to buy new ones in order to match with present life situations.

Job organization: Job organization in computer operating system vary and also crucial among individuals and organizations. Job organization has to do with planning and preparing for each task that requires processing as they come to the user for inputting into the system. There are no way users of computer could just process all task or job given to them at once hence the need to plan, organized and reschedule the job or task that require processing them one after the other. Before jobs are processed in the operating system, they are transcribed or coded to the languages which the computer understands to have an easy workflow by the user. The essence of job organization in the computer operating system is to have proper management in the central processing unit. The job organization becomes a very strategy or technique because it avoids unnecessary disturbance and distraction during the processing period. The job organization helps the actual processor judiciously align with the algorithm required in the program. Under normal circumstances, different set of tasks that required processing are submitted to the users for easy computational in the computer system.

The number of jobs that are processed are usually more considerable than when a whole number of jobs are competing one after the other. The allocation of job by the user brings prioritization such that, decision could be made based on the algorithm which the user has adopted to apply. The choice of job preparation before execution brings excellent work performance in the system based on the needs of the users. It provides better services and satisfaction to those who brought the jobs to be processed. Nevertheless, it is important to take job organization in computer operating system very seriously as it enforces people to do the appropriate things even when they are not willing to do so. This is also applicable to people in different phase of life, we must be fair to one another and treat them according when given any task to do. For example, many business organizations are not flourishing today because of lack of job organization as given to them by clients.

Cost of system maintenance: Cost of system maintenance has to do with the expenses involved in maintaining the computer after it has been acquired from the shop or company that produced them. System maintenance is something very crucial that every individual and organization must plan for at every point in time. The essence of system maintenance is to bring longevity to the life span of the system if such individuals and or organizations do not want to keep buying a new system every time. The system maintenance involves not just cleaning dust from the system but ensuring the computer system are equipped with adequate and required software that will guide it from attack and installing good and reliable software and programs needed for appropriate functionality whenever jobs or task are inputted into the system. This means that, budgetary allocation should be set aside for the purchase of all the required and mentioned items such as antivirus, Ms Office as MsWord, excels, among other things. Due to the nature, complexity and functionality of the computer system based on required job to be performed, components of memory system design, random access memory, and system and application software among others required proper consideration of system maintenance, otherwise, many of these components might not be able to function as expected. Therefore, in the light of the above, cost of system maintenance is not negotiable either with any individual or company. Bear in mind that, the computer operating system could be likened to the human body which require proper and adequate care and support, otherwise it could be affected with sickness or any other environmental factors hence the need to look after our body like the same to the computer system.

3.4 Components of Computer Operating System

The components of the computer operating system various in sizes and shape based on the functions they are meant to do. Based on extant literature, electronic projects focus (n.d) indicates on the following as components of computer operating system and they are:

- Kernel
- Process implementation
- Intersect
- Memory management
- Multitasking
- Networking
- Security
- Unser interface

(i) Kernel: The kernel is the core of operating system because it is the main layer between the operating system and the computer hardware. It essentially assists with process and memory management, file systems, device control and networking. The kernel affords operating system

straightforward level of control within the computer exterior. The kernel is known for its indispensable constituent which inputs task primarily, then resides in the core memory. The essence of this is to enable easy access and at the same time manages the various programmes inputted into the *random-access* memory. The kernel is known to generate programs that could access into the hardware resources. The kernel rearranges the state of the operating system such that, entering the central processing unit becomes easy for operation-ability whenever the user wants to use the system.

(ii) Process implementation: The process implementation provides a crossing point in the middle of the hardware and submission program thus allowing the software package to link from one end to the hardware devices. This would help the user of the system the processes and codes designed inside operating system. To this end, the software executes mostly all tasks that has been generated over the operating system kernel which are meant to use the memory vacuum and other types of information, data and documents in the system.

(iii) Intersect: Intersect has to do with how different programs interconnect in order to have good production of task that has been loaded into the system. Intersect within the operating system are essential as it help the program become more dependable due to the methods applied when communicating with other programs in the system. The intersect does not only include one kind of indicator among devices and computer system, but file within the computer which needs operating system to authorize precisely how the operations should be carried out. Each time, there is intersect, a signal within the system is acknowledged, then and there, the computer position whatsoever the computer program is processing at that time.

(iv) Memory Management: The memory management is such a significant component as far the computer operating system is concern as it serves as the backbone of the computer system. Due to the nature of the memory being the backbone that runs the computer systems, it is imperative to maintain the memory considering its function of managing the movement of procedures regressive and advancing in the middle of disk and core memory for the period of application. The memory helps to give pathway each time task is position for processing. The memory confirms by what method the memory could allocate the procedures to follow based on the time allotted to finalize the processing of the task or job. Each and every time the memory is not apportioned, then and there, its pave ways for correspondence for update of its standing. Memory management covers broadly the hardware, operating system and application memory.

(v) Multitasking: Multitasking has to do with doing several jobs or task at the same time. This implies that the computer operating system has the capability in carrying out several jobs even while busy with one. It could multitask without much stress due to the system and application software that are inherent. The multitasking being a components of computer system unveils occupied with numerous self-regulating jobs controlled by the computer programs within the same computer system. Multitasking permits a user to carry out more than one computer tasks at the same time. Subsequently several computers are able to execute more than one activity based on how the user apportion time, energy, skills and knowledge to each program in the system. Therefore, as students, multitasking is encouraged at any point in time.

(vi) Networking: Networking is significant within the operating system as procedures of job processing are fused together. Networking leads to communication of task within the system with one another that need to be processed. The strategy which could enhance communication within the system needs to reflect on transmitting, linkage approaches and security based on the problems being investigated. At present utmost all operating system preserves diverse networking procedures, hardware and applications used in the system. This implies that, the computer could operate on different network even while using the same operating systems especially when the network could share resources such as data, information, scanners, printers that make use of connections of wired and wireless networks.

(vii) Security: Security has to do with putting preventive measures to safeguard the systems. The essence of safeguarding the systems was based on the information and data stored in the system. The security surrounding system is to ensure proper functionality of the system is well protected. Therefore, the expectation is for any individual or organization not to give access to people without authorization due to the vitality of the information and documents stored in the system. The essence of this is to safeguard the entire operations that have been made over a long period of time in the computer operating system. It is believed and possible that when unauthorized individual has access to those information or documents, it could cause a lot of damage to the individual or organization. The security of the system becomes crucial for protection from external body. Since the computer systems is of importance, to the growth and development of the organization, many individuals should not be given access to the procedure of the various activities, hence the system could be damaged. The security of the computer could be influenced by diversity of technologies that perform the task in the organization. Presently since operating systems require number of resources, such as software, kernel and external devices, it become imperative for it to be security tight from any external body. This would enhance its longevity and maintenance from damage and unforeseen circumstances.

(viii) User Interface: A user interface (UI) allows users of a computer system access to all the operations and stored information within the system. This makes the operations of task easy for the user. It gives the user control over all that happens with the system. The user is able to navigate within the system based on exposition, experiences and knowledge of how the system functions. A user interface could command text and display it in relation to the instructions that guide the user as he/she continue to use the keyboard in the direction of application being required. The user interface operates through inputting of data and information into the system but there could be changes due to the evolving nature of application of the program as the system runs. The user interface is categorized into graphical user interface and command line user interface.

Another point raised by RMIT University (2014) with regards to the components of computer operating system are:

- The system should have a good communication channel,
- Ability to accept user instructions,
- Graphic user interface
- Have good monitor screen
- Workable mouse
- File director
- Device drivers
- Memory administrator
- Scheduler

Video



1.

<https://www.youtube.com/watch?v=hjsj5wFITUQ>

Video



2.

<https://www.youtube.com/watch?v=VTQ6AC1gsaA>

3.5 Policy of Computer Operating System

Policy is known to be rules and regulations set to govern individuals and organization based on the vision and mission statement of the institutions (West Virginia library commission (n.d). There is no organization 21st century that can survive without stated policy that guides their operations, especially with the use of system in carrying out their services to humanity. The essence of the policy is to ensure that certain rules and regulations regarding the use of the computer systems and its maintenance are followed by users and organizations. Due to

changes and nature of work that drive organizational goals, which are carried out by individual from different background, it would be appreciated that, policy should be made flexible, to accommodate every weakness and strength. The weakness and strength stipulate that, the rules and regulations were meant to guide the use of facilities meant to support service delivery even when they get damage as well. It is expected that while the policy is drawn, it should be documented and signed by those who want to use computer system.

Stiger (2003) notes that, due the evolving nature of computer and its application, the need to have policy that guides its security, procedures become essential. This would help users of the computer to be careful handling it as sometime someone could be prone to disaster based on its ergonomics state. Stiger further made mention of the following that must be taken into consideration for system maintenance and security and they are as follows:

- Safeguarding systems are repaired frequently
- Install and update anti-virus software
- Install firewall
- Ensure proper configuration of monitor for adequate programming of task
- Employing user management measures to protect users' interpretations and feedbacks

Another area of considerations according to Stiger (2003) is:

- Safety of the computer
- Procedural approach
- Inputting processes
- Maintenance culture must be maintained
- Level of reliability, privacy, and accessibility of the computer
- Protection against data and information in central processing unit
- Threats, viruses, worms, malware, ransomware, backdoor intrusions

Stiger (2003) mentioned the following policies that are crucial with regards to computer operating system and they are:

- Suitability use policy
- Right of entry control policy
- Change organization policy
- Information security policy
- Incident response policy

4.0 SUMMARY

This unit analysed the various functions, processes, techniques, and components associated with computer operating system. The reason for using computer operating system can also be attributed to operations or activities in library and information centres. It was stated in this study unit that, the computer operating systems are used for the following purposes: process management, memory management, resource management security management, command interpreter, file management, dependable background for software implementation and instructions, communicable flow and workstation, diverse use of hardware resources, relationship among users and hardware, organisation of hardware mechanisms, provision of location for software functionalities, provision of data managing, monitoring of system functionality, availability of marketable operating system and various software compatibility. In light of this, the processes with how the user is prepared to operate the system begin with the starting of the systems. By this, you get the system ready for use, by make it to run for a while for proper functionality, before task are inputted for processing. When the document or information has been processed, wait for it to bring out the result or output, then terminate or exit the system. There is need to ensure the system is properly shutdown, otherwise it might have adverse effect on the system when it is not properly terminated.

In the course of using the computer operating system, applying certain techniques are important This would enhance proper work processing, and quality assurance, through following the techniques below:

- Users' awareness
- Time allocation
- Training and re-training
- Upgrade of system
- Job organization
- Cost of system maintenance

The components of the computer operating system have the following components:

- Process implementation
- Intersect
- Kernel
- Memory management
- Multitasking
- Networking
- Security
- Unser interface
- The system should have a good communication channel,
- Ability to accept user instructions,

- graphic user interface
- Have good monitor screen
- Workable mouse
- File director
- Device drivers
- Memory administrator
- Scheduler

The components of the computer operating systems, safe guide every operation, through taking precautions adhere to. The computer operating systems uses policy for safety measures for the longevity of the system. The precaution which must be adhere to are: followed judiciously.

- Safeguarding the systems are mandatory
- Installing and update of anti-virus software
- Install firewall
- Ensure proper configuration of the system through installing the appropriate window and software
- Employing user management measures to protect users' interpretations and feedbacks
- Procedural approach
- Inputting processes
- Maintenance culture must be maintained
- Level of reliability, privacy, and accessibility of the computer
- Protection against data and information in central processing unit
- Threats, viruses, worms, malware, ransomware, backdoor intrusions

This is in accordance with the following policy:

- Suitability use policy
- Right of entry control policy
- Change organization policy
- Information security policy
- Incident response policy

5.0 CONCLUSION

Based on the understanding that surrounds the functions, processes, techniques, components and policy of computer operating system, application of management principles to its sustainability become essential. This arises from the nature and support the systems gives to both individuals and organization, for execution of their goals and objectives. The functionality or roles of the computer operating system are evolving either in the past and present circumstances of activities in human endeavours. Therefore, the professional could complete their roles based on task before them.

Self – Assignment Exercise

Which of the policy of computer operating system are most imperative and suitable?

6.0 TUTOR-MARKED ASSIGNMENT

1. Identify and discuss the functions of computer operating system?
2. What are the processes computer operating system are made up of?
3. Discuss the application of computer operating system in the 21st century organization
4. Identify and discuss the components of components which computer operating system?

7.0 REFERENCES/FURTHER READING

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UNIT 3 BENEFITS, BARRIERS, PRINCIPLES AND PRACTICES OF COMPUTER OPERATING SYSTEM

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Benefits of Computer Operating System
 - 3.2 Barriers of Computer Operating System
 - 3.3 Principles of Computer Operating System
 - 3.4 Practices in Computer Operating System
- 4.0 Summary
- 5.0 Conclusion
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

In previous module 1, unit 2, issues surrounding function, processes, techniques, components and policy of computer operating system were discussed. In this present module 1, unit 3, we shall be considering the benefits, barriers, principles and practices which relate to the application and use of computer operating system.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this study unit, students should be able to understand:

- The benefits associated with the use of computer operating system
- Barriers which users must be confronted with and ways to curb them in this ever-changing technological world.
- Have knowledge of the principles that surrounds computer operating system use and
- Be involved in the practices of computer operating system in order to master its use

3.0 MAIN CONTENT

3.1 Benefits of Computer Operating System

The benefits associated with computer operating system depend largely on the user and what it is meant to accomplish for the individual and organization that require its use. For example, multitasking, sharing

resources, security of data and information, are the benefits which Mr A could derive is different from that of Mr B. Manghnani (2021) mention the following as benefits associated with computer operating system. The benefits are:

(i) **Computing foundation:** Computing foundation, Manghnani (2021) refers to having mathematical and scientific knowledge and skills of the use of systems. Computing foundation is very essential in this scientific world where everything we do involves the use of systems. Computing foundation could also help people navigation in other subject areas.

(ii) **User-friendly interface:** One of the benefits of the computer operating system is that, it has user-friendly nature due to how it was built or developed. In this regard, users would not have to struggle while using it at all.

(iii) **Store house for sharing information:** Due to the various programs and how the computer operating systems was developed, it has the capacity for storing and sharing information. This means there are a lot of store houses.

(iv) **Protection of data:** The computer operating system could help to protect data and information stored in the systems.

(v) **Updating of software:** Whenever the system is running and connected to online platform, the programs help to update the software installed in it.

(vi) **Multitasking:** The computer operating system has the capacity to function carrying out several multitasking jobs and activities without much stress.

(vii) **Permits installation of diverse types of applications and process them:** When computer operating system is acquired, software and programs are installed for the smooth running of activities and functions. This means that, different types of such programs and software can be accommodated at the same time.

(viii) **Increases work productivity:** Work productivity is always increased due to the capability of the programs and drivers in the operating systems.

(ix) **Avoids time waste through reduction of complexity:** The applications and process of garbage in, garbage out, does not allow wastage of time when the systems are running or in operations. With

this in mind, the constituent of the systems is self-governing to each other.

In the same vein, Roomi (2019) attest to some the benefits that are associated with computer operating and they cut across:

(i) **User Responsiveness:** The computer operating systems has the capability to function responsively, thus creating room for more task to be done at the same time.

(ii) **Resource sharing:** one other benefit associated with the computer operating systems is that, it shares resources (data and information stored in the system) with other computers with they are connected through intranet and extranet.

(iii) **Ease of access to hardware:** The computer operating systems is developed in such a way that; it gives ease of access to the hardware used for carrying out the operations. The ease of access is also dependent on users' garbage in, garbage out and drivers installed in the systems.

(iv) **Doing many tasks at the same time:** The computer operating systems has the capacity to do many tasks at the same time due to the drivers, software and programs that help the systems to function.

(v) **Permit users due to several list of options, switches, signs for calm navigation:** The computer operating systems gives permission to the user based on options of things to do, thus allowing the user to switch, sign in and out with ease navigation.

(vi) **Easy of essential technical skills for operation:** Due to the knowledge and skills which the users have in operating the computer operating systems, certain technical skills required for operations become easier. Therefore, continuous acquisition of technical skills become crucial in operating and navigating within the system environment.

(vii) **Cost efficiency:** Cost efficiency was also noted to be among benefits associated with the use of computer operating systems. The reason is that, instead of paying much money for services of word processing and browsing, differently, the two services can be paid for once, thus saving money and time of the user or seeker of information.

(viii) **Accountable to regulatory and influence of computer utilities:** The computer operating systems is accountable to all regulatory and

influence over the computer utilities. This implies that, the drivers help to control and take regulations of activities that happen in the operating systems whenever it is functioning.

(ix) **Has stages for comfortable programs:** The stages at which the systems operate differs from one program to another. Therefore, each stage of operations is determined by the tasks and program in operation, such that, the systems will not jam.

(x) **Authorities features for plug and play:** The operating systems has the features to operate simultaneously, even though there are multiple task that is ongoing.

In light of the above explanations, Roomi (2019) further refers to others benefits associated with computer operating systems. They comprises of controller of many devices such as mouse, keyboard among others, uses many methods of memory subdivision, summoning and transaction, it can manage own memory with diverse practices, alteration to different programs for better processing, has the ability to synchronize task within the system, capable of managing all interruptions, has the capability to implement all schedules based on techniques, could supports external disintegration, answerable to the distribution of all data and information in the system, provides permission for difficult task to handle, allows distribution of many information with users, has the linkages of resources like printer, CPU, monitor, mouse etc and provides flexibility with interface of connecting different types of software, for easy functionality of the system.

3.2 Barriers of Computer Operating System

Barriers means obstacles to progress or improvement of work done or activities. Barriers cannot be avoidable among individuals and organizations. Barriers help to improve organizational growth because when barriers are discovered and solution is sort, the solution would be applied to eradicate such barriers from happening in the future. Several barriers have been identified by Manghnani (2021) regarding computer operating system. This comprises of:

(i) **Expensive nature of the system:** By expensive nature of the system, we mean the high cost of price tagged to the systems during purchase. The expensive nature of the systems could result to bad and dwindling economy, too much cost in production, transport for delivery, high cost to pay the engineers who manufactured the products and paying for services. These are different factors that could result to expensive nature of the system. Cost has a positive and negative effect in the use of the systems.

(ii) **Unreliable system:** During configuration and installation of drivers and software, complication was encountered hence someone could see that some systems are unreliable. This could also result to poor maintenance culture and lack of how to operate the systems.

(iii) **Complexity of the system:** By complexity we mean how difficult it is to use the systems. Computer operating systems are now very user friendly, such that, users would no longer struggle using them. Complexity has posed a serious challenge or barriers to users in accomplishing their task considering the nature of the systems they are given to work with. For example, iPhone, Apple, iPad, Windows 10 does not work the same way with other common systems of Nokia and Samsung. Therefore, when planning to acquire computer operating systems, there is a need to put this into consideration.

(iv) **Virus threats:** Virus threat has shown to be one of the most barriers affecting the use of computer operating systems. So, when installing any antivirus, it should be a good one especially if you want the system to last longer. There are many antiviruses today in the web or markets that are not very good and strong. Irrespective of the data and information in your systems, they can still attack your system.

(v) **Disintegration of the system:** When computer operating systems are purchased, there is a need to ensure they are well protected with antivirus and good drivers, otherwise it could be disintegration or broken down with external factors of antibodies.

Another point raised by Roomi (2019) regarding barriers in computer systems are: high-cost new systems, some of them are difficult to operate, restriction with icons of operating systems, distended memory access, interior fragmentation, some of the computer-generated memory require adequate knowledge for their operations, unidentified users, system deprived of permission, some are difficult tasks to handle, use substantial system network, require multifaceted algorithms and the device driver and intruder signs is not easy to access.

3.3 Principles of Computer Operating System

Computer operating systems are rooted in some basic principle and without such understanding; it becomes difficult to thrive with its application. The principle of computer system is tied to its purpose used to better different ways of learning and unlearning. Among the principles that surround computer operating systems according to Stanley (2018) are:

Applications: By application, Stanley (2018) refers to how someone apply to use computer operating system. First, the system is purchase, for what reason. Thereafter, the need to know how to make use of it come next and when that is done, the system can now be applied for several or different purposes. It is meant to solve problem and render services for individuals and organisations. Many computers have variation of requests that are put together in their operation systems. This could enable widespread collection of activities that require different function. The user in his/her workplace learning could restructure how the programs could be used. The use of Microsoft office differs from one individual to another based on the built-up workroom based on processing of data and information. The worksheets and schedules on when they apply it also differ. The explicit style and image of symbols of the software package are significant for its application. There is no way the computer could be acquired without its application and use. Different application for which the systems could be applied are

Input: When information or data has been inputted for processing purposes in the main memory of the computer operating systems. Another principle of computer operating system is to make sure information or data are inputted into the system. The definition of input leads to the procedures where computer perform work differently based on the kind of automated computers available. With regards to the laptop computer and desktop, their input processes are frequently carried out through the use of the keyboard and mouse. Many keyboards that are used abroad ensure that the QWERTY designs are employed. This is also associated with diversity of pads with alternate complete keys. The mouse is believed to offer a portion of computer irrespective of their type on the ground that, there is touch-pad somewhat underneath the keyboard. The mouse does a lot of work even to the extent of separating the component used to plugs into the computer. This is also used to instruct the applications of activities within the system. There are some smartphones which uses touchscreen crossing point, throughout the period where task is program in the system.

Output: The outcome or result transferred from the main memory to the outside world. When data or information has been processed, the result comes out in the output device. This comprises of outcome where task has been treated or completed. The computer is logged with many tasks or activities that take place within the central processing unit and when they have been processed, comes out in the output device of the computer system. The output procedures of the computer usually employ pictorial and sensory system fragments. One of the major output devices is the monitors which offer a graphical indication to users. The monitors are distinct portion that is connected to the computer from end-

to-end cables. The audio also serves as output device that afford the speaker in the system to become heard even while the monitor works. The auditory output could be apprehended over headphones that are plugged in the output port.

Input and Output Devices: The idea behind input and output devices are better understood when it comes to the functionality of computer. The devices are typically linked to computers due to how vital they are with the central hardware that carry out the operations in the computer. The input hardware helps to direct data to the computer, while the output devices guide information to the outer surface while the user is position.

Networking: A computer network is a set of computers sharing resources located on or provided by network nodes. Networking is the connectivity with nodes within the systems. It can also be seen as connecting people from one region to another with wired and wireless connectivity. With regards to the computers, there are lots of networking that take place within the system. This allows linkage from end to end of sharing information and applications within the programs. It is normal for computer to get connected as that provides access to various programs in different databases. The web is another measure through which networks are connected together especially with connectivity across the world. Without the use of computer even if there are no networks, how could people connect, especially with computer which enhances the networking within system? Through this measure, interaction in emails, chats and social networking are carried out.

Mouse and Keyboard: The mouse and keyboard serve as distinct characteristic of input that is connected through the computer's unit. The mouse and keyboard occupy an entry management position in the computer. The mouse and keyboard give authorization to the user in order to oversee and command responsibilities that cut across breakers, entering and writing on the web. The keyboards originated through the typewriters over a century years ago. Presently, varieties of them are available both in wireless and normal laptop computer.

Monitor: The monitor is the computer box where many features of the hardware are stored. The monitor is a composite that could be likened to human being due to visual directions that it gives to every part of the computer. It is categorised as an output device that support the system functionality. The monitor transmits a representation, which is prepared by the computer software system. The user of the computer guides through different operations in the program which are inputted into the processor, thus, displaying itself inside the software system. The nature

of the monitor determines what features and sizes it possess, as some are analog, while others are digital.

Printers and Scanners: The printer and scanner which are associated to hardware execute diligently joined function. The printers being an output device is made yield pictures and text from the computer. While the scanners work opposite through inputting manuscript and image photos in the computer system. Therefore, both the printer and scanner should not be undermined on what they are capable of doing for any individuals or organisations.

Microphone and Speakers: The microphone and speakers are sensitive part in the computer system. They are used for listening, speaking and diffusing information with other people in different places especially when communicating. There is scenario where we could use it to listen to music on our own in quiet places or homes. The microphone and speakers give extraordinary superiority audio to the computers. Many computers are associated with integral speakers that are attached as external devices. The speakers are unit of input device; classically with calibre because they authorise voice diffusion over the Internet and voice soundtrack.

3.4 Practices in Computer Operating System

Students are interested in learning new ideas and new knowledge on each of the concepts. Therefore, the practices of learning new ideas in computer operating system would help them to advance in their career progression. Key point which could help students in their studies are aligned with the findings by Bunt (2000) and White paper (2015). Bunt (2000) and White paper (2015) note that, the practices that surrounds computer operating systems would give student several opportunities to learn and acquire new ideas in the following practices:

(i) Research activities in academia: Research activities in academia is the act of carrying out systematic inquiry, thus leading to the expansion, testing, assessment, design and contribution to the generalization of existing knowledge. The outcome of the research leads to publication of articles, mini dissertation, and monograph. In present day information and knowledge economy, research activities have become so demanding such that, without the use of computer operating system to support most of the practices, it become difficult to accomplish the task required. Those in the academia would agree and testify that, the use of the system to process their research data, type research articles and other work operation before publications is very significant. Besides, take for instance those attending workshops, conference and seminar amidst those taking minutes in meetings, make use of the Ms Word interfaces

beneath UNIX operating system due to its compatibility. The teaching, learning, community engagement and academic citizenship carried out in the university and any higher institutes environment have become so profound due to how computer operating system have been used to enhance every of their operations on daily basis. Students in their bid to grow academically have also cultivated the culture of using the system to support their studies and carry out their school task/assignment. In light of this discussion, there is no way the practices of using computer operating system can be quantified especially in this era of unprecedented circumstance where covid-19, could no longer allow academic staff and students to meet at their usual teaching and learning classroom interface, but operates from different geographical locations (Bunt, 2000; White paper 2015).

Job operations: Another fundamental practice through which the computer system was created was for job operations. Job operations involve the process of carrying out specific and/or generic work. The job operation could be to develop a graphical work, a module, and type or write a letter regarding minutes of meeting, or assignment given to students or staff members to accomplish. This varies from one individual to another. The usage of computer operating system has become so diverse and encompassing considering the multiplicity of people involved and nature of work that must be accomplished within a short period. Computer operating system is very crucial among individuals and organizations in present day information and knowledge economy, because it helps the individual to align their planning better in preparation for execution of task that require processing as they come to the user one after the other. There are general and specific work operations which users of the system must accomplish within a certain period, otherwise, it becomes too clumsy and difficult to assemble or handle (Bunt, 2000; White paper 2015).

Before jobs are processed in the computer operating system, they are transcribed or coded in the languages which the computers understand to have an easy workflow by the user. The essence of such job organization in the computer operating system is to have proper management in the central processing unit. The job organization becomes a strategy or technique because it avoids unnecessary disturbance and distraction during processing period. The job operations help the processor judiciously align with the algorithm required in the program. Under normal circumstances, different set of tasks that required processing are submitted to the users for easy computational in the computer system (Bunt, 2000; White paper 2015).

The allocation of job by the user brings ordering such that, decision could be made based on the algorithm which the user has adopted to

apply. The type of job prepared before execution brings orderliness of how the work is performed in the system. It provides better services and satisfaction to those who require quality service delivery.

(iii) Use in training and re-training of people: Extant literature search has shown that, computer operating system is used for (a) training of newly employed staff on specific and general job responsibility and (b) retraining of old and new staff on certain program introduced, software that require mastery and short course that would support them in their daily task. This is carryout to include students and other individuals who require their application and appreciations. The training and retraining of staff members in the organizations would increase their exposition, knowledge and skills for better quality service delivery in the workplace learning. Presently, most individuals and organizations irrespective of their types make use of the system to train their staff, because usually when they are newly recruited or employed, there are some fundamental that they must be accustom to and with those things, it might be difficult for them to function. The experiences, knowledge and skills gained during the training and retraining in computer operating system would make staff in organizations, and students in university not to forget what they have learnt. The justification behind this explanation is that, computer operating system has shown to enhances ones understanding based on the knowledge gained while using the newer technologies (Bunt, 2000; White paper 2015).

Training and retraining imply the act of engaging in further education of acquisition of knowledge and skills required for advancement of work operations. Training and retraining in computer operating system are also a practice used to showcase exposition where new knowledge is added to one's intellect based on existing task that require administration. The acquisition of such new knowledge and skills will advance the user or individual to apply the use of the tools with much struggle, especially in this era of changes. It is indispensable that, training and retraining contain diverse practices that must be mastered for users of system to become more familiar and rooted in its application considering the wave of technologies and best practices in workplace learning. As students continue to advance in their studies, the acquisition of higher qualifications, requires adequate training and retraining. This is associated with those using computer system to process information and data. The process of learning and unlearning at the university level or any higher institution of learning should be taken seriously by any individual, especially with users of system and students taking this program. This consideration is seen in the changes that evolves on continual basis within systems application (Bunt, 2000).

(iv) Security and surveillance: Security is the act of putting safety and protection in place either within a house, organization, cities, countries and the world at large. While surveillance is the monitoring and observing all the security that are in place. The essence of security and surveillance is due to so much insecurity, social justice and crimes happening across the world today. Another reason for security and surveillance, is lack of trust difficult to find among individuals or people. Companies have device different ways through which security gadgets and appliances are placed in homes, offices, banks, market places. This would help control and minimize theft and crimes happening or experienced on daily basis. The essence of the use of the computer operating system is to monitor, control and safeguard the environment from unauthorized access. Presently, properties, houses, banks, companies or any valuable things are secured through the support and security of computer operating systems. What the computer operating system does is monitor through cameras and other security and surveillance gadgets connected to them. There are different software applications of alarms system, locks and password doors used to prevent any unauthorized individual from having access to those things. The use of system or computer could be used as applications processes required to monitor the environment having installed the software to perform such task. Presently, libraries have also adopted computer operating systems to monitor their information resources, computers and other gadgets in their institution or environment. In this world of unprecedented circumstances, having a security and surveillance is important due to many crimes that keeps erupting based on crave for wealth and materials things in this world.

(v) Information and knowledge management: Information and knowledge management are combination of two variables. Information refers to the outcome of a processed data meaningful for action and decision making. While knowledge management entails application of different techniques to collect data and information, create, share, use, manage and disseminate for the growth of individual and organizational needs. Information and knowledge management have become so crucial in origination because experts or individual working in the organization uses information in addition with the knowledge in their brain/mind to drive or function in the system. However, in the context of computer operating system, information and knowledge management is the combination of tacit and explicit knowledge inputted (garbage in) and garbage out. The information in the computer operating system helps in fostering all the functions carried out in daily basis in the organization.

The multifarious information and knowledge produced in diverse field across the world resulted in the use of computer operating system to manage them. The computer operating system has the capability to

process, store and disseminate billions of information through the use of different gadgets. For example, applying different types of systems, such as, transaction processing, decision support, knowledge management systems, database management systems (Bunt, 2000; White paper 2015) among others. The nature of the use of operating system require adequate information and knowledge and maintenance culture for its longevity. Based on evolving process of how information are spreading in newspapers, TV, magazines, coupled with the knowledge individual carry in their brain, the need for application of computer operating system for their practices as a means of preservation measures become significant. This would help advance the longevity of having access to the preserved information and knowledge.

(vi) Applications of business enterprises: Application of business enterprises has to do with a scenario where businesses are established to meet individual and societal needs. The business owner uses different approach of manual and technologies in enhancing and fostering the growth of the business in the economy. In this regard, the business enterprises continue to grow as population is also increasing resulting to better service delivery on daily basis. The business world has become so evolving that there is nothing someone could do today without the use and support of computer operating system. For instance, different production companies now make use of the operating system in ordering their products through online platform, book flights to attend meetings and buy good, among other things too numerous to mention. This is also applicable to those in the medical field. Another consideration which relates to the use of computer operating system is bank transactions, ordering medication, teaching and learning in higher education institutions. Online transaction cannot function on their own, hence the practices surround good. Therefore, students being the purpose for which this module was developed and the future of tomorrow should advance to make use of computer operating system to better their lives and studies at all time (Bourgeois and Bourgeois, n.d).

4.0 SUMMARY

This unit examined the benefits, barriers, principles and practices associated with the computer operating system in any workplace learning. It was established that, diverse set of benefits were seen in the use of computer operating systems and this consists of computing foundation, user-friendly interface, store house for sharing information, protection of data, updating of software, multitasking, permits installation of diverse types of applications and process them, increases work productivity, avoids time waste through reduction of complexity, support reduction of pains that require access to numerous data, data are renovated within the computer system, constituent self-governing, users

responsiveness, safety, Resource sharing among many more. While reflecting on the benefits seen in the use of the system some barriers were noticed and they are: expensive nature of the system, unreliable system, complexity of the system, virus threats, disintegration, cost which are relatively high, complexity with use, restriction with icons of operating systems, and distended memory access of the system just to mention a few.

The principles of the computer operating systems were basically on the applications, input, output, networking, input and output devices, mouse and Keyboard, monitor: printers and scanners and microphone and speakers. This also brings us to the various practices in organization and by individuals. The practices for which computer operating system are meant indicate areas of:

- Research activities
- Job operation
- Used in training and re-training of people
- Security and surveillance
- Information management
- Application in business enterprises

5.0 CONCLUSION

Interestingly, there is no way we could quantify the benefits associated with computer operating system due to the evolving nature of the features that make the system to work. Unfortunately, certain challenges were also identified in the course of reflecting on earlier benefits mentioned. Although it is worthy of note that, the principles of computer systems and practices which make individual and organization such as library and information centres and related institutions to be involved in its acquisition are awesome and remarkable in relation to the changes of transformation in our present economy.

Self – Assignment Exercise

With vivid examples, write short notes on the various practices of computer operating system?

6.0 TUTOR-MARKED ASSIGNMENT

1. Identify and discuss at least benefits associated with computer operating system in relation to meeting human and organizational needs in today's economy?
2. What implications do the barriers noticed in the computer operating systems has in organizational growth?

3. How has the principle of computer operating system sustained working of libraries in recent times in Nigeria?

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MODULE 2 NEW TECHNOLOGIES IN COMPUTER OPERATING SYSTEM

Unit 1	Definition, Objectives, Features, and Types of New Technologies in Computer Operating System
Unit 2	Functions, Processes, Techniques, Benefits and Challenges of New Technologies in Computer Operating System
Unit 3	Applications of the New Technologies in Computer Operating System

UNIT 1 DEFINITION, OBJECTIVES, FEATURES AND TYPES OF NEW TECHNOLOGIES IN COMPUTER OPERATING SYSTEM

CONTENTS

1.0	Introduction
2.0	Objectives
3.0	Main Content
3.1	Definition of New Technologies in Computer Operating System
3.2	Objectives of New Technologies in Computer Operating System
3.3	Features of New Technologies in Computer Operating System
3.4	Types of New Technologies in Computer Operating System
4.0	Summary
5.0	Conclusion
6.0	Tutor-Marked Assignment
7.0	References/Further Reading

1.0 INTRODUCTION

In previous module 1, unit 3, the benefits, barriers, principles and practices of computer operating system were discussed. In this present module 2, unit 1, we shall be considering the definition, objectives, features and types of new technologies in computer operating system. This was to broaden students understanding regarding the new technologies that are now in use in the bid to eradicate old ones.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this study unit, students should understand the followings:

- The definition of the new technologies in computer operating system
- Familiarise themselves with the objectives of why the new technologies in computer operating system are of great significant
- Learn the understand why the features of new technologies in computer operating system are needed for the system to function better
- Acquaint yourself with the various types of the new technologies in computer operating system

3.0 MAIN CONTENT

3.1 Definition of New Technologies in Computer Operating System

The debate regarding new technologies in computer operating system is not new globally, except in some developing nations that are yet to inculcate such drive into their system. In actual sense, computer operating system has become part of human lives which they work with on daily basis. The drive for new technologies in computer operating system was due to the changes that have evolved across the world and workplace learning with regards to innovation and development leading to inventing of new knowledge and production of goods and services. The new technologies have helped to improved how human apply their commonsense into service delivery irrespective of the domain and geographical locations.

Mandal (2020) notes that, the development of new technologies was as a result of old technologies over stayed their usefulness could no longer be productive as expected based on the functionality which it was expected to perform or process task, hence the re-creation of newer technologies to replace the former ones. In this regard, we could say that the new technologies are better improved technologies with appropriate software and system applications embedded in them. The development of new technologies is not application to system only, rather it applies to every part of our lives as individuals. As we grow up and become much older as human beings, we do away with our clothes, shoes, beds, and materials things that we use on daily basis. This implies that, as changes evolves in life computer and information technology companies are forced to also change the facilities used in workplace learning, schools and homes in order to better out lives and service delivery. Since 2002 the rate at which many of these computer industries have change and

increased the production of technologies to better the lives of human being and the society.

Another emphasis made by Bubb (2019) alludes that, the new technologies encompass all field of study. The new technologies are now found in diverse industries such as games, film, medicals, education, sports, computing world, aeronautics, engineering, just to mention a few. The new technologies are those advanced computers or technologies capable of doing so much like what humans' beings is capable of doing. They are measured in relations to human models. This implies that they take the position of human being in most cases which are presently used in the world of science and technology. The debate regarding why we do need human model technologies was due to crave for power and broaden knowledge such that, human could rule the world and become famous and powerful and command respect and wealth. This resulted to the many scientific manipulations and discoveries found across the world today. If we take a look at the computer and electronic engineering and advances in medicine today for an instance, we would affirm that most of the mystery behind their success was due to the support which these new technologies have influenced their operations hence the recorded results, otherwise, there is no way human being could have worked so hard to attain this on their own (Bubb, 2019).

Another indication which is also profound with regards to the new technologies that are created or developed in recent times, is that, human wants or needs are difficult to meet and because humans are also not static but dynamic, the need to advance from one phase of another become significant. The lives of a man revolve round many factors of life and that could also lead to the creation of new technologies that would better activities carried out by human being. Human beings do not have to struggle in order to do so many things at a time such as purchase items online, book a ticket, make bank transactions, order medication, teaching and learning online among others. This was through the enabler of the computer operating system.



1. <https://www.youtube.com/watch?v=B5fuzSuk2WI>



2. <https://www.youtube.com/watch?v=2fNm2ZrGGhw>



3. <https://www.youtube.com/watch?v=7vQznLKEfBs>



4. <https://www.youtube.com/watch?v=TxRIIdL2CDBk>

3.2 Objectives of New Technologies in Computer Operating System

The objectives that necessitate the new technologies in computer operating system has become philosophical when relating it to how the world have also evolved. Although emphases by scholars regarding this school of thought is encompassing which require unveiling for better appreciation and application to human existence. Tassej (1999) notes that, there are different approaches to this philosophical debate on the nature of new technologies. The new technologies were created by human beings but capable of doing so much more to the expected of humans. For example, the artificial intelligence or robotics is capable of executing so many work operations due to the programs embedded on it.

Tassej (1999) attested to the following as objectives of new technologies in computer operating system. The new technologies have the ability to regularize and maintain different innovation is their watch word. Other things which were considered as the purpose for its creation are multitasking in productivity, its own standards are ascertain, it has superiority and dependability, has sophisticated infrastructure or software, economically valued, compatible, very interoperability, easy connectivity, has coded application and system software, hypertext system operations, has efficiency and effectiveness of data and information processing, a good communications networks, consistency and uniformity is ascertained and have the device for risk tasking (strong antiviruses).

Basu (2019) referred to the following as objectives associated with computer operating system. These form alliance with another operating system, such as:

- (i) Product development: The new technologies embedded in the computer operating systems is developed such that, it could be used to create new product required for goods and services.
- (ii) Integration of stakeholders: Stakeholders could be integrated into purchasing and using them for their organizations, and business operations.
- (iii) Compatibility of components: The components developed in the

systems is very compatible for different operations and functionality of tasks to be carried out.

- (iv) Processing of data and information at a very fast rate: The rate at which data and information are processed in the program is very fast. This is due to the drivers, antivirus and systems software running in the systems.
- (v) Permit comprehensive team work: The new technologies developed in the computer operating systems work comprehensively amidst team work.
- (vi) Broader interconnectivity within networks: The system software that drives the computer operating systems has the capability to function through various interconnectivity of broader networks, irrespective of the location.
- (vii) Process enhancement: The procedures through which data and information are processed, collated and transferred have become more enhanced such that the users would not have to struggle.
- (viii) Cost efficiency: Due to different version currently available in the new technologies of computer operating systems, acquiring one is no longer difficult, because many products are now produced by different companies.
- (ix) Competitive advantages: The new technologies have also brought much competition among companies and business analyst due to the products and services required and rendered.
- (x) Innovative touchscreen features: The new technologies have innovative touchscreen features such that, users would no longer struggle to carry out certain functions of word processing, browsing, downloading and multitasking.
- (xi) Offshore and online interface: The new technologies can also be used in both offshore and online platform incase the user wants to change the techniques or mode of operations.

3.3 Features of New Technologies in Computer Operating System

The features of new technologies of computer operating system are so vital and must be taken into consideration for the longevity of the system, such that, while using the computer system, proper and adequate care and maintenance culture would be appropriated to it.

IOWA State University extension and outreach (2021) made mentioned of the following as features associated with the new technologies in computer operating system and they cut across:

- (i) Broader outlook: The nature of the new technologies in computer operating system was made such that, it has a more visible and bold images when images and items are presented in the screen. The outlook normally used for email facilities are user friendly.
- (ii) Flexible tool box: The tool box in the new technologies in computer operating system are flexible such that anyone could learn easily on it.
- (iii) Has several devices: The devices of the new technologies in computer operating system are so many. Therefore, individual could use those devices for different operations and functions.
- (iv) Compatibility for different operations: The new technologies in computer operating system are compatible for different task by the user, especially when multitasking.
- (v) Universal system operation: Irrespective of the person using it and the environment, the new technologies in computer operating system have the capability for use anywhere in the world.
- (vi) Smooth transitions: The new technologies in computer operating system could function smoothly considering the tasks inputted in it. This result to the programs in the systems used for the operations.

Other features which the new technologies in computer operating system have according to IOWA State University extension and outreach (2021) are (a) numerous programs and connections, (b) setting accessibility, (c) quick feature, (d) fragmented screen for easy workability, (e) quick updates of features when activated online, (f) broaden search bar, (g) personal interaction voice with the devices, (h) diverse features of Microsoft office, (i) accessibility to different applications, (j) backup device, (k) easy download features, (l) easy connectivity while online, (m) ultra-low power battery consumption, (n) full IPv6 support, (o) exact time harmonization in sensor network, (p) advance correlation analysis

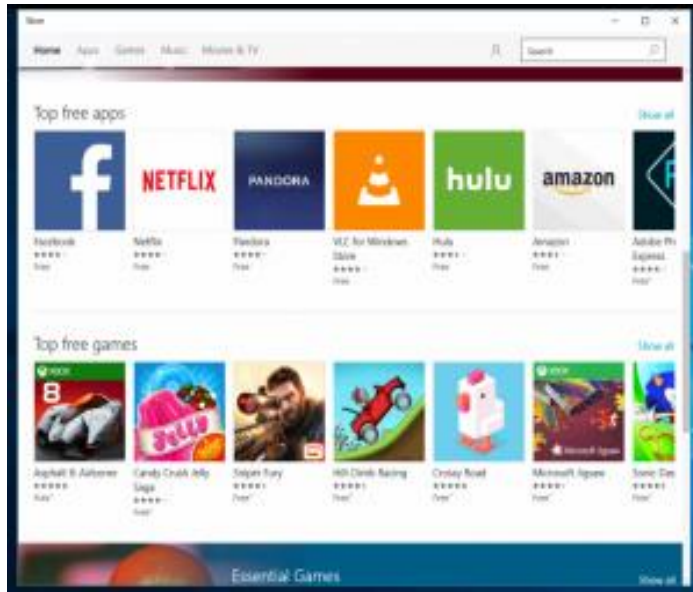


Fig 38: Features of computer operating system

3.4 Types of New Technologies in Computer Operating System

The types of the new technologies in computer operating system vary with its diversity of work operations and year of development. When the development of computer system started, what was obtained were different which could not meet the expectations of man and this metamorphosed into broader ones, ranging from one generation to another, thus leading to the creation of newer ones based on the need for better service delivery (Mandal, 2020). Drawing analogy from previous computer operating system that was first developed indicated in the body of this text, it was established that, the abnormalities were enormous and this brought about newer and better technologies that we have today. Among the different types of new technologies in computer operating systems that are available according to Mandal (2020) are:

- Artificial intelligence
- Blockchain
- Augmented Reality (AR) and Virtual Reality (VR)
- Deep Learning (DL)
- Internet of Things (IoT)
- Cybersecurity
- Big Data technologies
- RPA (Robotic Process Automation)

(i) Artificial Intelligence (AI): Artificial Intelligence (AI) is first ever among the latest technology that has conveyed diverse transformation today's world of technologies. AI is human machine in nature which answer to stimulus based on certain task or responsibility that needs to be carried out (West, 2018). This is as a result of the human capacity of

scrutiny, decision and purpose (West, 2018). It is not new though as it has been in existence for quite a number of years now, though not in optimum use as expected. Presently, AI has become one of the famous and trending technologies used by different people in their homes, cars and offices, to meet their information needs. There are numerous electronic gadgets associated with AI based on the trends at which their operation has evolved globally. Some examples with specific reference to libraries and information centers are map and navigation, facial detection and recognition, text editors, search and recommendation algorithms, chatbots, digital assistants, social media, and e-payments.



Fig 39: Artificial intelligence



Fig 40: Another look of Artificial intelligence of new technologies

(ii) **Blockchain:** By blockchain we imply a good track of record protection technology manufactured such that, hackers will not be able to have access to the system any day any time. This technology produces virtual currency, bitcoin that hit the market a lot. The currency, bitcoin has taken over the whole world with an increasing currency rate. Those who have invested in bitcoin has gained a lot from here since this is a virtual currency. Apart from that blockchain has great potential as it reaches almost all the industries present today from healthcare to real estate. Some examples of blockchain used in libraries are digital

preservation and tracking, community-based collections, inter-library and voucher systems, library verification of credentialing.

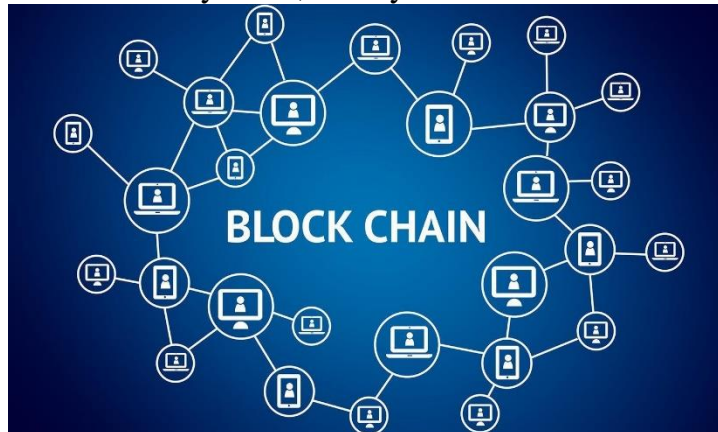


Fig 41: Blockchain of new technologies

(iii) Augmented Reality (AR) and Virtual Reality (VR): The AR and VR is a known technologies for its peculiarity that work very fast in any areas especially in detecting objects which emerges from one that allow someone experience almost, something to be adjacent to real. At the moment, progressive effort has been made in the gaming and AR and VR gadgets from previous years. Numerous large commercial enterprises have employed the use of AR and VR gadgets based on the results obtained by users of 3D projection, for communicating and futuristic efforts. Some examples of augmented reality (Ikea mobile App, nintendo's pokémon Go App, Google Pixel's Star Wars Stickers, Disney Coloring Book, L'Oréal Makeup App, and Weather Channel Studio Effects, while for virtual reality used in libraries, information centres and knowledge organizations are: Oculus Rift, Samsung Gear VR, HTC Vive, Google Daydream View, or and Google Cardboard



Fig 42: Augmented reality and virtual reality of new technologies



Fig 43: Another look of augmented reality and virtual reality

(iv) Deep Learning (DL): The deep learning is a machine-based learning, which is structured for learning based on artificial neural linkages. Deep Learning has the procedures of numerous layers which someone could remove higher-level production from based on the result of the fresh input. In image handling, the edges are subordinate layers although faces, digits are the main human consideration for a higher-level. Some examples of deep learning with specific reference to libraries, information centers, and knowledge organizations are virtual assistants, translations, use of drones, chatbots and service bots, image colorization and facial recognition.

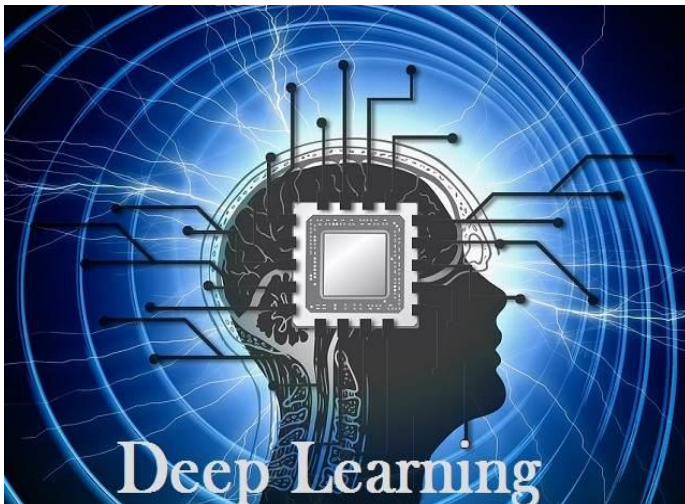


Fig 44: Deep learning of new technologies

(v) Internet of Things (IoT): IoT has to do with a system of interconnected objects which are linked together in order to amass and relocate data above a wireless network devoid of human interference. The IoT remains the greatest broadly embraced use of unified computing devices, numerical technologies and entities which transfers data without the prerequisite of human-to-human/and or human to computer interface. It generates virtual linkage that connects several devices that work flawlessly from end to end of distinct monitoring

center. The devices collect and make available data almost needed for use in the environment which they are required for operation. Some examples of Internet of things with specific reference to libraries, information centers, and knowledge organizations are connected appliances, smart home security systems, autonomous farming equipment, wearable health monitors, smart factory equipment, wireless inventory trackers, ultra-high speed wireless internet and biometric cybersecurity scanners.

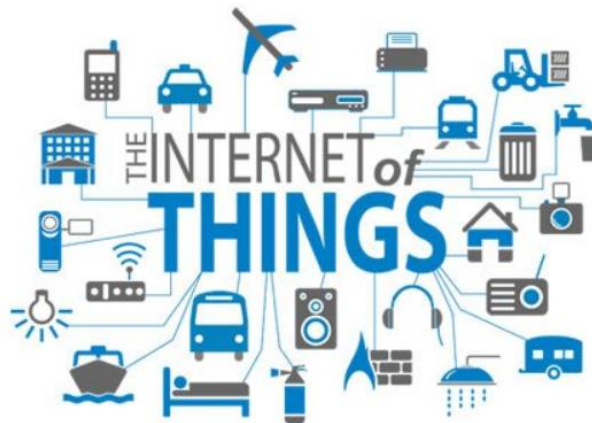


Fig 45: Internet of things of new technologies

(vi) **Cybersecurity:** Cybersecurity has to do with the contemporary security feature which are used to protect internet-connected systems that consists of hardware, software and other form of security obstacles which need attention. In this era of digital technologies, cybersecurity helps to protect digital attacks, information leakages amidst border of cumulative of crimes. Cybersecurity is made to support proffering security to these destructive layers.



Fig 46: Cyber security of new technologies

(vii) Big Data technologies: The Big Data Technologies is a software that is utilized to integrate data mining, storage, sharing and imagining. These terms embraced where data could be framed up due to the tools and practices available for their incorporation and transformation. Example of big data technologies are operational big data technologies and analytical big data technologies. Data are significant for any task or decision made by individual and organizations. Therefore, it is imperative it should be accessed, stored and made available for decision making and planning in all field of endeavours. The typologies of data are nominal, ordinal, discrete and continuous. Since many organizations now depend strongly on data for their existence and operations, the introduction of the concepts of “knowledge society and “knowledge worker” in 21st century vis-à-vis “big data” technologies become essential. With this in mind, the use of big data technologies such as Hadoop ecosystem, NoSQL database and R programming and Data lakes become essential.

Research activities are even ongoing to under study how data could be harness and harvested and made available to companies. It embraces volumes of information that could supports in data management operations especially where there is big and composite failure regarding management tools to execute task. The classification of Big Data technologies is Data Storage, Data Mining technologies, Data Analytics technologies and Data Visualization technologies.



Fig 47: Big data technologies

(viii) **RPA (Robotic Process Automation):** Robotic are artificial machines used in place of human beings. They are form to operate like humans. The robotic process automation permits everybody to computerize everyday task even in a repetitive manner. There is no individual and industries that would not require the procedures adopted for continuous support. The help which the RPA, gives to everybody especially in automated requirement cannot be quantified even when it becomes complex writing the codes of such automation jobs.



Fig 48: RPA (Robotic Process Automation



Fig 49: Another look of RPA (Robotic Process Automation

4.0 SUMMARY

In this module, we have identified and discussed the desire for new technologies in computer operating system, which has brought changes to the world today. The changes involve invention and expansion in all sphere of human endeavours, prominent to production of goods and services. The new technologies have assisted humans in applying their knowledge and skills in quality service delivery regardless of the geographical locations. The intention of the new technologies resulted to old technologies that could no longer achieve the purpose for which they were desired and wanted by humans. The efficiency and effective has

become low, especially as the desires of man continue to grow. It can also be alluded that, the new technologies include all fields of human being is concerned. The new technologies are now found in diverse industries such as games, film, medicals, education, sports, computing world, aeronautics, engineering, just to mention a few. The new technologies are proficient of doing so much like what humans' beings is capable of doing. We also mentioned the objectives of the new technologies in computer operating system to include:

- Regularization in technologies is maintained
- Innovation is their watch word
- Multitasking in productivity
- Standards is ascertained
- Superiority and dependability
- Sophisticated infrastructure or software
- Economic value
- Compatibility and interoperability
- Easy connectivity
- Coded with diverse application and system software
- Hypertext system operations
- Has efficiency and effectiveness of data and information processing
- Good communications networks
- standard crossing point
- consistency and uniformity
- devices for risk tasking (strong antiviruses)
- Product development
- Integration of stakeholders
- Compatibility of components
- Processing of data and information at a very fast rate
- Permit comprehensive team work
- Broader interconnectivity within networks
- Process enhancement
- Cost efficiency
- Competitive advantages
- Innovative touchscreen features
- Simulation interface
- Offshore and online interface

It can also be affirmed that due to the nature of the new technologies, certain features that has enhanced its productivity consist of the following:

- Broader outlook
- Flexible tool box

- Has several devices
- Compatibility for different operations
- Universal system operation
- Smooth transitions
- Includes of numerous programs and connections
- Setting accessibility
- Quick feature
- Fragmented screen for easy workability
- Quick updates of features when activated online
- Broaden search bar
- Personal interaction voice with the devices
- Diverse features of Microsoft office
- Accessibility to different applications

Due to the multifarious task individual and organization are saddled with, several types of new technologies of the computer operating systems are now available and used and they are:

- Artificial intelligence
- Blockchain
- Augmented Reality (AR) and Virtual Reality (VR)
- Deep Learning (DL)
- Internet of Things (IoT)
- Cybersecurity
- Big Data technologies
- RPA (Robotic Process Automation)

5.0 CONCLUSION

The creation, acquisition, application and use of the new technologies of computer operating system have brought several debates to humanity. This is as a result of some of the intricacies surrounding unfriendly nature, knowledge and skills required to navigate within the system. Prior before now, individuals and organizations including libraries and information centre have device ways of assisting users and at the same time carrying out their daily task. But the introduction of some of the new technologies also has their challenges and this has caused more difficulties to organization. Nevertheless, the challenges would not deprive students from thriving towards acquiring and using the new technologies mentioned in this module considering the era of digital technologies that we are currently in.

Self – Assignment Exercise

What are the objectives of new technologies of computer operating system?

6.0 TUTOR-MARKED ASSIGNMENT

1. Write a short note on five new technologies of computer operating system?
2. What features is associated with the new technologies of computer operating system
3. With vivid examples, write short notes on the various types of the new technologies of computer operating system?

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UNIT 2 FUNCTIONS, PROCESSES, TECHNIQUES, BENEFITS, AND CHALLENGES OF NEW TECHNOLOGIES IN COMPUTER OPERATING SYSTEM

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Functions of New Technologies in Computer Operating System
 - 3.2 Processes of New Technologies in Computer Operating System
 - 3.3 Techniques of New Technologies in Computer Operating System
 - 3.4 Benefits of New Technologies in Computer Operating System
 - 3.5 Challenges of New Technologies in Computer Operating System
- 4.0 Summary
- 5.0 Conclusion
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

In previous unit, issues relating the definition of new technologies in computer operating system, objectives, features and types were discussed. In this present unit, we shall be considering, the functions, processes, techniques, benefits and challenges of the new technologies in computer operating system.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this study unit, students should be able to:

- Identify and discuss the functions of new technologies in computer operating system
- Processes involved in the new technologies in computer operating system
- Master the techniques required of the new technologies in computer operating system
- Appreciate the benefits associated with the new technologies in computer operating system
- Proffer solutions to the challenges of new technologies in computer operating system

3.0 MAIN CONTENT

3.1 Functions of New Technologies in Computer Operating System

The functions of new technologies in computer operating system differs from one program and task to another. Although several functions can be carried out no matter the complexity and unfriendly nature of the new system. But it could be difficult, when users have not mastered the trick behind their application and operations. Pedamkar (2020) referred to different functions through which the new technologies could be used and they are:

(i) Create a setting where users could navigate and interact with the hardware: usually when making use of a new technologies, there is the need to create a setting that would enhance or enable the user to operate better. A setting such as new folder and applying personal knowledge and skills of operation ability

(ii) There is expediency and effortlessness of executing task or operations: The expediency and effort of executing task or operations depends largely on personal knowledge of the users. Therefore, acquiring further knowledge and skills that could enhance the use of systems is very crucial.

(iii) Security provision at all times is certain: Presently, many virus and hackers attack technologies. This calls for security provision of antivirus and use of codes and password to restrict non accessibility to systems and newer technologies. This would help to prolong its life span and maintenance.

(iv) System presentation is high resulting to tangible achievement: The system should be presented such that, it would bring good result to the inputted data or information. The presentation as it is in computer, garbage in, garbage out.

(v) There is provision for multitasking due to several applications embedded in it: The new technologies have the capability for multitasking due to several applications embedded in it. The multitasking process implies, doing several works at the same time.

(vi) There is confidentiality of system computing showing error when such is detected: When information and or data are being processed, and errors occurs, the system is able to detect it appropriately.

(vii) Users could process multifarious tasks irrespective of geographical location. This is further advanced through communication medium

(viii) It gives proper coordination, interpreter, compiler and assemblers of task to be executed: One of the functions of the new technologies in computer operating system is that, it gives proper coordination to the interpreter, compiler and assemblers of task inputted.

Other functions which Pedamkar (2020) note are:

- The system is able to decide which memory should be given which program specific task and how much time allotted for the job
- The main memory has the capacity to accomplish several bytes processed in the central proceeding unit
- There is the assurance for the memory to track the status of all processed tasks or jobs based on the traffic regulator
- Management operations of all company task which includes, communication, delivery, ordering, monitoring, programming etc
- Used for secured filing directories
- Check and balancing of work chat flow within and outside the organization
- Used to support installation of all software and hardware purchased for use
- For uploading program in the systems and outputting results

Other emphases made by Gelemter (2003) regarding what functions the new technologies in computer operating system is capable of doing are:

- Cross tabulation of task in the mainframes, memory, recordings and display by user
- Allot of features for use in any operations
- Could process large document through enabler of programs and standardized memory
- Efficiency and effectiveness are certain while programmes are installed
- The system is a life documentary that stores all information for easy retrieval
- Proper management of metadata
- There is indexed automatically
- There is software upgrading while online and working/operating

McKechnie (2019) also points out the following's functionalities:

- Spontaneous communication among employees, contractors and customers
- Used in taking account of management systems
- Support for data management systems
- Control of management information systems
- Used in the sustenance of customer connection management

3.2 Processes of New Technologies in Computer Operating System

The processes applied in the use of new technologies differ from one individual to another in the organization. This result to the understanding or knowledge possess by the individual. Prior knowledge of how the systems processes information and data could help harness what needs to be done when integrating the new technologies for work. performance Kerl (2020) alludes the followings as processes of integrating the new technologies of computer operating system to organizational use and applications. The processes are:

- Need to consider the right technologies, for example, library and information centre require library management systems, OPAC to solve the organization problem
- Pull team members together that could work on the new technologies
- Conduct a pilot program required to make the system works
- The need to train staff to have the right knowledge and skills on how to use the new technologies
- Need for take-off, fine turning the new technologies to suit organization needs
- Need to also create maintenance culture for the new technologies adopted for the organizational operations

In the same vein, Attfield (2009) made mention of other ideas which are significant regarding the processes and this cut across the following:

- It must align with the organisation objectives and goals
- It should be beneficial to everyone in the organisation
- Create an opportunity for everyone to learn and grow in their jobs
- Provide needs for staff members to be trained and acquire more skills
- Deliberate on diverse scholarship styles and desires for staff members
- Staff members should see it as something important, as such, they should derive pleasure to learn and become more acquainted with its use

3.3 Techniques Required to Use the New Technologies in Computer Operating System

Techniques have to do with different approaches or methods through which operations are improved. Therefore, in line with the techniques required for the new technologies for computer operating system, the following could be of interest to individuals and organizations (Qurat-ul-Ain, Aqeel, Khan, Khan and Haider, 2010). These were the opinion of Qurat-ul-Ain, Aqeel, Khan, Khan and Haider, (2010), as listed below:

- Continuous research to understand how the new technologies work
- Application and use of good software and programs
- Adaption of flexible approach to ease the use of the new technologies
- Organizational needs and training of staff in the use of new technologies
- Give staff task that will propel them to be motivated to want to use the new tools
- Create a scenario that would make the new technologies form part of the users
- Masters the skills and knowledge of application to use the new technologies
- Make the new technologies a play toy such that, the features of the memory manager would be well understood by the user
- There is need to learn the allocation strategy of jobs that require progressing
- Being conversant with the computer languages is also very imperative
- Continuous training and retraining of staff
- Maintenance culture of the new technologies by staff members
- Installation of strong antivirus to fight against external bodies
- Free flow of communication between the use and the system is very important
- Make sure the programs that runs in the new technologies are well secured and operation-ability
- Updating of the new technologies for antivirus and software maintenance

3.4 Benefits of New Technologies in Computer Operating System

The benefits associated with the new technologies in computer operating system as stipulated by Mandal (2020) can be categorized into (a) efficiency and effectiveness and (b) financial benefits.

(a) **Efficiency and effectiveness:** Speed of processing task, innovative strategy utilized, agility for user to operate, dynamic to the user, Has various working tools and resources, compatible storage devices and security application to guide stored information.

(b) **Financial benefits:** Brings people together, functional for all types of business operations, Automation of products with less effort, and offers great connectivity measures with different people over the world.

Other form of benefits which is associated with the new technologies according to Stella (2014) are:

- Provision for other modern technologies
- Diversities of innovation when in use
- Less effort for much result when computation is ongoing
- Improved efficiency
- Support mobility
- Enhanced battery
- Greater security
- Well organisation workflow station
- Manageability is optimum
- Advanced data protection tools
- Very stable and movable
- Better users experience
- Troubleshooting
- System restoration is quicker
- Lower cost obtained
- Quicker and additional dependable communication
- The new technologies have improved the use of the following functionalities of communication platform such as email, mobile phones/applications globally, use of websites and pages, social network sites among others

3.5 Challenges of New Technologies in Computer Operating System

While reflecting on the benefits of the new technologies in computer operating system based on the effort through which the system has supported individuals and organizations in accomplishment of task and goals, several challenges were noticed. The challenges were categorized into financial, electricity/energy, human resources, skills, and expertise.

(i) **Financial:** Finance has to do with the money required to purchase items or facilities in the organization. It is the life blood of every organization. It is a crucial resource when it comes to purchase and maintenance of new technologies in computer operating system.

Presently, there is no individual and organization that could do without finance. The result of lack of finance was the dwindling economy, where circulation of money is limited. Besides, many organizations do not have much interest budgeting adequate finance for the sustainability of their operations. Some of the challenges associated with finance are: habitually enormous costs for purchase and maintenance of the technologies for business and other task, many businesses have been shut down due to its high risk of theft, when it is bad, sometimes it is difficult to repair or fix due to its complexity, when there are no security measures to safeguard it applications and lack of maintenance measures

(ii) Electricity/energy: Electricity connotes the energy or enabler of source of power to capacitate the technologies. Some of the challenges associated with electricity/energy are: a lot of risk for business opportunity, when there are no security measures to safeguard it applications

(iii) Human resources: Human resources implies human beings required to operate the new technologies. Some of the challenges associated with human resources are: too much dependence on the technologies, the latest technologies are not user friendly, insecurity with safeguarding it, its confrontation to accommodate changes, inadequate exposition to training and use could lead to technological unfriendliness and lack of maintenance measures

(iv) Skills: Skills are the capability to use new technologies. Some of the challenges associated with skills are: there are lot of updates and much volume of software required to keep it running, sometimes when you make the wrong choice of the system, it could lead to other problem, and when staff are unwilling to adapt to its use due to its newness.

(v) Expertise: Expertise has to do with the knowledge of the individual regarding the use of new technologies. Some of the challenges associated with expertise are: interfere with operations, when the right program is not installed, when staff are unwilling to adapt to its use since it is a new technology

In the same vein, PNJ Technology Partners (2021) listed the following as interfering attributes that could make the new technologies not accomplish its purposes and this are as follows:

- Accepting new technologies due to its newness when there is no need for its use
- When the right system and procedures were not properly followed
- When staff members find it difficult to accept the new

- technologies due to phobia
- When staff members were adequately not exposed to different training that would enhance its use
 - When there are no required data and network to run the system

Forbes Technology Council (2019) also alludes to diversities of challenges confronting the new technologies in computer operating system and they are:

- When there was no concrete decision whether there is need to upgrade the system and someone does
- When decision was also not taken of the technologies that would work best for the organization of individual
- Integrating systems that does not speak to the goals of the organization
- When you attach to much attention to the documentation of the system
- When the hardware and software are not well protected and maintained
- There is need to consider its complexity before adopting a user who is not willing to learn
- Migration could have some effect on it especially when the new environment is not suitable to your work operations
- The flexibility of the system is important but when it is not considered it could be a challenge
- Change management must be consciously monitored otherwise it will pose a problem to the use of the system
- When the applications are kept running for a longer time than expected
- There is no need to make it the only system to depend on hence the need for alternative backup

4.0 SUMMARY

In this unit, it was established that, the functionality of the new technologies as it relates to the computer operating system has developed more consideration to the complexity and unfriendly nature seen in some of them. This was due to the complained users of the new technologies laid whenever they use the system. The consideration given to the new technologies was based on issues related to the functions for which they could be applied in the creation of setting where users could navigate and interact with the hardware, expediency and effortlessness of executing task or operations, security provision at all times is certain, system presentation is high resulting to tangible achievement, provision for multitasking due to several applications embedded in it, confidentiality of system computing showing error when such is

detected, users has the possibility to collaborate with multifarious engagement in irrespective of geographical location, proper organizers to possible coordination, interpreter, compiler and assemblers of task executed, main memory has the capacity to accomplish several bytes processed in the central proceeding unit, the system is able to decide which memory should be given when program specific task and how much time allotted for the job, assurance for the memory to track the status of all processed tasks or jobs based on the traffic regulator, management operations of all company task which includes, communication, delivery, ordering, monitoring, programming etc, used for secured filing directories, check and balancing of work chat flow within and outside the organization, used to support installation of all software and hardware purchased for use and uploading program in the systems and outputting results among many more factors too numerous to mentioned.

It was observed that the process of the new technologies in computer operating system involves the following:

- Need to consider the right technologies that could solve the organization problem
- Pull team members together that could work on the new technologies
- Conduct a pilot program required to make the system works
- The need to train staff to have the right knowledge and skills on how to use the new technologies
- Need for take-off, fine turning the new technologies to suit organization needs
- Need to also create maintenance culture for the new technologies adopted for the organizational operations
- It must align with the organization objectives and goals
- It should be beneficial to everyone in the organisation
- Create an opportunity for everyone to learn and grow in their jobs
- Provide needs for staff members to be trained and acquire more skills
- Deliberate on diverse scholarship styles and desires for staff members
- Staff members should see it as something important, as such, they should derive pleasure to learn and become more acquainted with its use

In light of the above, several techniques which could be applied in the new technologies were identified as: continuous training and retraining of staff, maintenance culture of the new technologies by staff members, installation of strong antivirus to fight against external bodies, free flow

of communication between the user and the system is very important, make sure the programs that run in the new technologies are well secured and operation-ability, updating of the new technologies for antivirus and software maintenance, continuous research to understand the intricacies of the new technologies, application and use of good software and programs, adaption of flexible approach to ease the use of the new technologies among others. We also discovered that different benefits were associated with the new technologies and this includes: brings people together, speed of processing task, innovative strategy utilized, agility for user to operate, functional for all types of business operations, dynamic to the user, has various working tools and resources, compatible storage devices and security application to guide stored information, automation of products with less effort, offers great connectivity measures with different people over the world, provision for other modern technologies, diversities of innovation when in use, less effort for much result when computation is ongoing, improved efficiency, support mobility, enhanced battery, greater security, well organization workflow station, manageability is optimum, advanced data protection tools, very stable and movable, better users experience, troubleshooting, system restoration is quicker, lower cost obtained, quicker and additional dependable communication, the new technologies has improved the use of the following functionalities of communication platform such as email, mobile phones/applications globally, use of websites and pages, social network sites among others.

In light of the benefits, challenges were also noticed, and this include too much dependence on the technologies, habitually enormous costs for purchase and maintenance of the technologies for business and other task, latest technologies is not user friendly, a lot of risk for business opportunity, many business have been shut down due to its high risk of theft, insecurity with safeguarding it, a lot of update and much volume of software required to keep it running, when it is bad, sometimes it is difficult to repair or fix due to its complexity, sometimes when you make the wrong choice of the system, it could lead to other problem, its confrontation to accommodate changes, inadequate exposition to training and use could lead to technological unfriendliness among others.

5.0 CONCLUSION

Interestingly there is no individual and or organization that do not want change, hence the infiltration of new technologies become significant, especially in this era where we need a lot of support for what we do at our workplace. The new technology associated with computer operating system has opened the eyes of organization such that they do things better than expected. The emphasis that surrounds the functions,

processes, techniques, benefits and challenges of the new technologies of computer operating system, could help users to improve more while using the computer systems to apply management principles of planning, organizing, coordinating, monitoring/evaluation and staffing to restructure the workplace learning. The new technologies have become part of the human being due to the impact it has and would continue to create to enforce job performance. The features embedded on the new technologies has made it to transform how people work, think and apply their mind in decision making and planning on daily basis. The usefulness of the new technologies cannot be compromised in relation to the functions, processes, techniques and benefits if organizations such as library and information centres among associated ones need to grow and expand globally. This means that, present day librarians need upskilling in order to integrate themselves into continual use of the new technologies for functional job performance.

Self – Assignment Exercise

What techniques are required in application and use of the new technologies of computer operating system?

6.0 TUTOR-MARKED ASSIGNMENT

1. Identify and discuss the functions of the new technologies of computer operating system?
2. What are the processes involved when it comes to the new technologies of computer operating system?
3. With practical examples, describe the benefits associated the new technologies of computer operating system?
4. In what ways could the challenges of the new technologies affect present day organization of library and information centres in Nigeria.

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UNIT 3 APPLICATIONS OF THE NEW TECHNOLOGIES IN COMPUTER OPERATING SYSTEM

CONTENTS

- 1.0 Introduction
- 2.0 Objectives
- 3.0 Main Content
 - 3.1 Application of The New Technologies in Computer Operating System
- 4.0 Summary
- 5.0 Conclusion
- 6.0 Tutor-Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

In the previous unit, we discussed issues associated with the functions, processes, techniques, benefits, and challenges of new technologies in the computer operating system. Meanwhile, in the present unit, we shall be considering the application of the new technologies in computer operating systems.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

At the end of this unit, students registered for this course should be able to understand:

- Define the concept of application of the new technologies in computer operating systems?
- How the application of the new technologies in computer operating systems assist the students in their academic pursuit?

3.0 MAIN CONTENT

3.1 Application of the New Technologies in Computer Operating System

The application of the new technologies in computer operating systems is significant considering the present situation of work ethics where certain procedures must be followed. This does not mean whoever is concerned with the use of the system but rather to ensure that, the organizational goals and objectives are sustained for humankind and the growth of every economy. The rationale towards applying the new technologies in computer operating systems is to bring transformation to the organization and reawakening of staff commitment to job


performance.

Gipper (2021) made mention of the following as ways through which the new technologies in computer operating system could be applied in different workplace learning. The application differs in operations and task to be accomplished. Therefore, based on Gipper (2021) findings, it was established that the new technologies could be applied in the following ways:

- Deployment of applications software
- It could be applied in the production of goods and services in many companies within and outside the globe
- It could be used or applied in the educational sector where teaching, learning and research activities are carried out on daily basis
- It has also been applied in the health sector where medical practitioner such as nurses, doctors and other health workers in diagnosing and treating sick people and testing symptoms and operations of chronic diseases
- It is now used in the airways where pilot fly aircrafts without much struggles
- For security and surveillance of crimes and theft and other unforeseen circumstances
- It helps to give access to stored information and data that are difficult to harness and obtain in different work place by individuals and organizations
- The new technologies in computer operating system have also been applied to library service delivery in most developed world where internet connectivity surrounds all institutions in order to advance support to students and staff for their job performance. This ensures access to document delivery and supply.
- Through the support of the new technologies, there is guarantee of availability and accessibility to multifarious information and knowledge in diverse format required by academics to advance their teaching and learning and publication of articles. By this act, irrespective of the geographical locations, users of libraries and others could access and download materials of billions counts.
- The use or application of the new technologies has advanced and promoted security given to sustainability of internet Freud and theft and especially those in banks and financial institutions. This security measures are also applicable to individual homes and companies, thus preventing external bodies from entering their system.
- The new technologies have also changed the way of lives for many individuals across the world where they apply it into their service delivery for jobs, security management, production of

- goods and services among too many factors to mention.
- It could be used for software and program design required for any operating system
- For decision making and planning in organizations
- Marketing strategy and commercialization
- Video conferencing and presentation of papers among several people
- Help users to create initiatives in their process of job executions
- It has brought a huge shift from traditional to virtual platform where several activities are executed among people and in organizations
- Transformation of the economy in diverse ways such that, it brings progression in what people do
- It has been incorporated into different industries such as cars, food, clothing and textile among others.

 1. <https://www.youtube.com/watch?v=3QHvOuZJAXM>

 2. <https://www.youtube.com/watch?v=mXw9ruZaxzQ>

4.0 SUMMARY

The application of the new technologies in computer operating system has become so profound that it can be applied in different workplace learning. Therefore, its application depends largely on the kind of services and task and the user in question. The followings were the various ways through which it could be applied and they are: distribution of requests, production of goods and services in many company within and outside the globe, educational sector for teaching, learning and research activities, health sector for cross examination by medical practitioner such as nurses, doctors and other health workers in diagnosing and treating sick people and testing symptoms and operations, airways where pilot could fly aircrafts without much struggles, security and surveillance of crimes and theft and other unforeseen circumstances, access to information and data difficult to harness and obtain in different work place by individuals and organizations.

5.0 CONCLUSION

The applications of the new technologies in computer operating systems are indispensable for the upgrading of the organizational system. Lack of the permeation of the application of new technologies could cause a lot of challenges with service delivery and timeous appropriation of the task. Therefore, the need for libraries and information institutes to plan for the acquisition of new technologies becomes sinquanon, as it serves as the backbone to everything they do in the organization.

Self–Assignment Exercise

As a Library and Information Science Student, what step would you take to plan for the application of new technologies in computer operating systems in a newly established university library?

6.0 TUTOR-MARKED ASSIGNMENT

1. Discuss what the application of the new technologies in computer operating systems entails?
2. How will the application of the new technologies in computer operating systems assist you as a student in your academic pursuit?

7.0 REFERENCES/FURTHER READING

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MODULE 3 APPLICATION AND SYSTEM SOFTWARE

Unit 1	Definition, Objectives, Features and Types of Application and System Software
Unit 2	Functions, Processes, Techniques, Components, Benefits, and Challenges of Application and System Software,
Unit 3	Uses, Implication and Distinction between Application and System Software

UNIT 1 DEFINITION, OBJECTIVES, FEATURES AND TYPES OF APPLICATION AND SYSTEM SOFTWARE

CONTENTS

1.0	Introduction
2.0	Objectives
3.0	Main Content
3.1	Definition of Application and System Software
3.2	Objectives of Application and System Software
3.3	Features of Application and System Software
3.4	Types of Application and System Software
4.0	Summary
5.0	Conclusion
6.0	Tutor-Marked Assignment
7.0	References/Further Reading

1.0 INTRODUCTION

In previous unit, we considered the application of the new technologies as it relates to the computer operating system. Presently, we shall be considering we discussed issues related to the definition of application and system software, followed by objectives, features and types of application and system software in organization.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this unit, students registered for this course should be able to understand:

- What the application and system software entails
- Define the objectives of application and system software
- Elucidate the features of application and system software

- Evaluate the types of application and system software and what they used for in the organization

3.0 MAIN CONTENT

3.1 Definition of Application and System Software

Jha (2019) notes that application software has to do with diversities of programming tools which support the computer in execution of programs. Although this varies with the task which they are meant to handle. The understanding that surrounds application and system software is very broad considering the interpretation of different scholars based on recent research findings in the field of computer and its associated operating system. The crave for knowledge across different fields of study resulted in advance use of technologies. Advance use in technologies necessitate application of programs in system software. Different design is meant for different applications and the application could do a number of activities such as handle text, numbers, audio, video, graphics and other task that are MS word platform (Jha, 2019).

The application software which is meant to support computer operations based on the different numbers of programs are also regarded as end-user programs (Jha, 2019). The user of the computer is able to complete his/her task of job formation, amendments, use of spreadsheets, databases, sending emails, online search strategy and navigation, playing video games, successive businesses, graphic designs among many other functionalities (Jha, 2019). The use of application software in the computer operation system is surrounded with property and use of moralities, software design languages coupled with output and purposes of the use of the system.

Learn computer science (n.d) states that the application software are software programs that offer precise functionality which the user requires in order to operate the computer. Once the application software is installed, it therefore means the user should be able to navigate within the system (Learn computer science, n.d). There is no system that could function without the support of the application software being part of the engine that drives the computer. The application software is an indispensable element required in every computer system. Due to the diversities of operations such as writing mails, browse on the internet, manipulation of documents of finance, play games etc, which the computer is used for, it is imperative an operation ability application software is installed. The different task or jobs mentioned used different application software for their programming (Learn computer science, n.d).

Another consideration made by Bourgeois and Bourgeois (n.d) regarding application software is that, it has to do with software embedded in the computer system that execute definite particular, informative, and occupational functions. For this function to be proper executed, each of the programs is designed to support the user with specific procedure required in the output, imagination, and communication by the user (Bourgeois and Bourgeois, n.d). In light of the above explanation, if a user of the system wants to write an article or research paper, the application software program of Microsoft word would be required for operations. Again, if any individual wants to listen to music, the program of iTunes is needed. For someone to search the internet or web, the program of Internet Explorer or Firefox would be required. So, this is how it is applicable to any type of task or activity which must be carried out (Bourgeois and Bourgeois, n.d).



1. <https://www.youtube.com/watch?v=M-6WvDU9JNg>

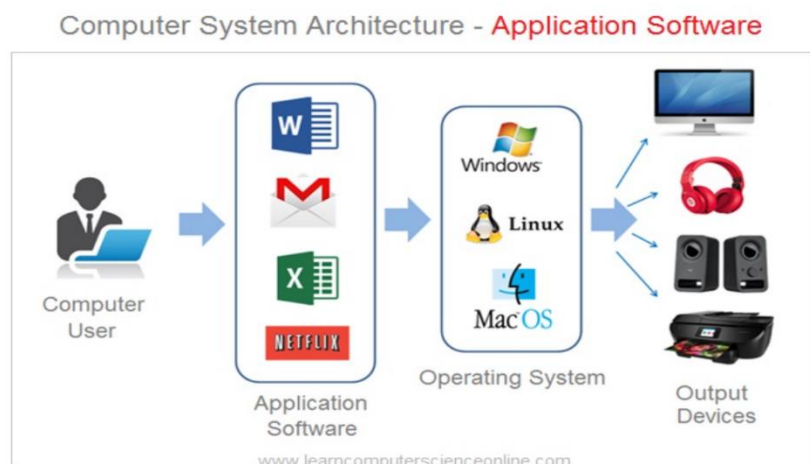
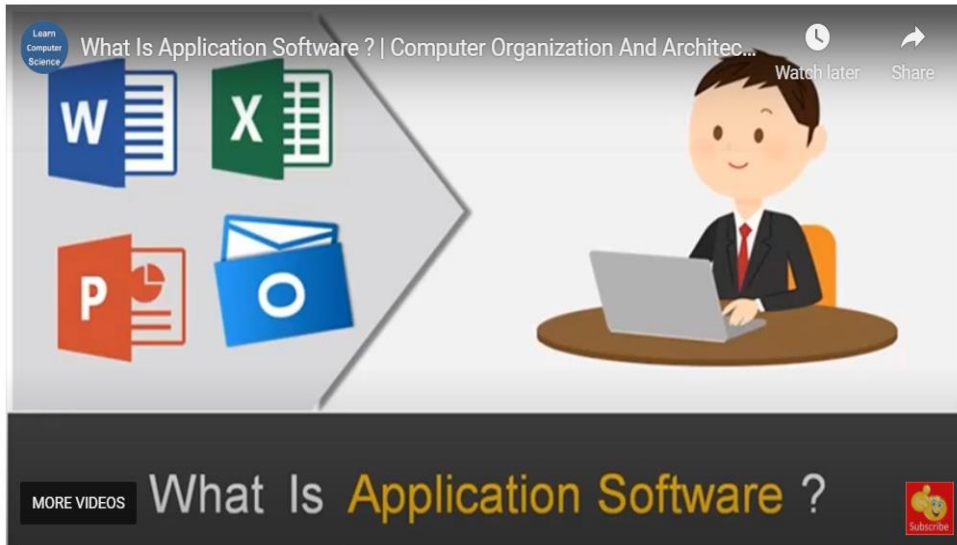


Fig 50: Application software image



<https://www.learncomputerscienceonline.com/application-software/>

Fig 51: Application software image

Learn computer science (n.d) alludes that, the system software are those programs that enable the system to interconnect with both the hardware and constituents. In another dimension, Bourgeois and Bourgeois (n.d) were of the view that, the system software is the crossing point or intermediary that helps with communication in the middle of the other software and the hardware. The system software streams communication between software, hardware and the user (Bourgeois and Bourgeois, n.d).



1. https://www.youtube.com/watch?v=Xu_H_D0Gz38
2. <https://www.youtube.com/watch?v=joB4A-8FfPo>

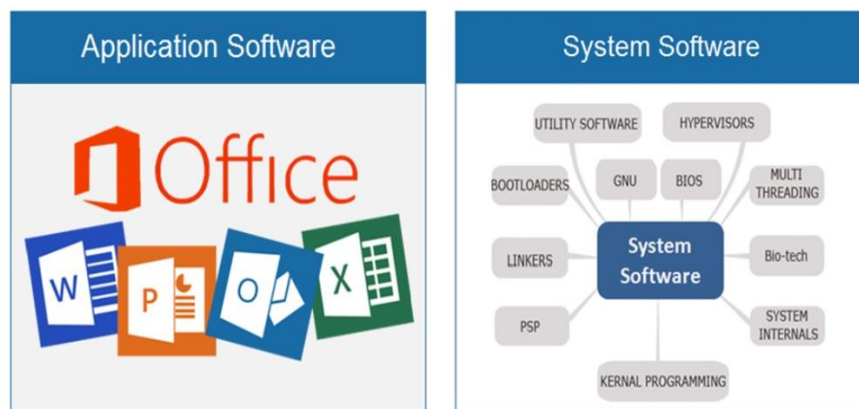


Fig 52: Application and system software image

Several differences arise between the application software and system software. These can be categorized considering how important it is in the computer system. Without the application and system software, the

computer cannot carry out any functionality. The reason is that, this software is used for different purposes. The system software controls majorly all the activities that are programmed into the system based on the command and communication received from the application software. Due to diversities of applications that are embedded in the operating system, the system software helps to manage and drive the system hardware components. It is imperative to note that, the functionality of the application and system software are unquantifiable as far the computer system is concerned. Based on this analogy, it is evidence to know that different school of thought has it that irrespective of the geographical location, no individual or organization could do without the support of the application software and system embedded in computer systems.



1. <https://www.youtube.com/watch?v=JxkEkWpo6Vw>

3.2 Objectives of Application and System Software

Application software implies the programs used to support the functionality of computer during operations. While system software enables communication between software, hardware and the user (Bourgeois and Bourgeois, n.d). The objectives of the application and system software are so crucial in present day information and knowledge economy, where individual and organizations require them for their day-to-day operations, irrespective of the geographical region. Sreejith (2020) alludes to the following as objectives through which application and system software are required. Among these are:

- Facilitate diversities of activities
- Management of information
- Handling of data
- Fabricating visuals
- Bring together resources
- Computing figures
- Designing of task
- Information access
- Manages users' relationship with the system
- Building blocks of stored information and data
- Easy access and retrieval of documents from the central processing unit
- Broaden customization approaches
- Enhances business opportunities
- Strengthen capability of the organization

3.3 Features of Application and System Software

The features of application and system software cannot be undermined as long the use of computer operating system is concerned. The feature helps to drive the operating system into accomplishment of task. Therefore, in order to advance the work operations carried out in any organization the features of the application and system software must be taken seriously. Among the features of the application and system software as stipulated by Pedamkar (2020) is:

- Implement task on a more generalized way
- Improves the use of programs for easy transmitting of word processing, worksheets, email, picture editing among others.
- It requires more storage space as the work or task expands
- Ability to design in a more collaborating way for flexibility to the user
- Usually transcribed in high-level language

These features have assisted in the use of some of the software of Microsoft office of excel, word, PowerPoint, outlook, internet browser such as Firefox, safari, chrome and mobile applications of Pandora for music appreciation and skype for real time online communication and slack for team collaboration. Guru99 (2021) made mentioned of the following as the features of application and system software and they consist of the followings. The features are:

- System Software drives every computer activity
- It is of most significant for close much relationship with the user and system
- The operation of its processing is low-level language
- The design of the system software is not easy to understand ordinarily
- Work at amazing speed
- Less interactive
- Minute in size
- Difficult to manipulate

3.4 Types of Application and System Software

The nature and services which application and system software are saddled with, has made it impossible sometime to differentiate between their types. However, exposition and experiences with users gave the insight of their make and types. Guru99 (2021) states that, the capacity of task which the application and system software does showcase its types. The greater the application and system software embedded in the system, the more load or task/activities it is likely to carry or do. While those with less application and system software, the less task it is

capable of executing. There are different types of application and system software. Sreejith (2020) states that among the types of application software are:

(i) Presentation software: The presentation software allows the user of the system to assemble all the task or job requisition that needs to be processed before they are inputted into the computer system. This makes the job much easier and simpler to handle. With this in mind, you would be able to navigate and visualise what could be done on how to operate within the office and other environment. The presentation software helps you to demonstrate information in the method of transparencies. Your slide is made much more educational where text, images, graphs, and videos are incorporated into it. The presentation software consists of three components: Text editor which help to input and arrange items such as text, graphics, text, video, and multimedia files especially with the slideshow that display most of what is processed on the system.

(ii) Web browsers: The web browsers are software applications that are used by computer analyst or any individual to navigate the Internet especially when searching for information. The web browsers allow any individual to find and recover data and information within and outside different field of study on the web. There is different web browser but the prevalent ones are Google Chrome and Internet Explorer.

(iii) Multimedia software: The multimedia software helps to generate different records that comprises of images, audio and video. This type of multimedia software has showed instances where it could be used for diverse widespread animatronics, illustrations, image, and video elimination. Current instances comprise of VLC media player and Windows media player used in most music industries and organisations today.

(iv) Education and reference software: The education and reference software of application software are software mainly used for academic purposes especially when it comes to the formulation of learning materials required to enable the teaching and learning of different subject discipline. In this regards, different types of lecture software are used and continued to be used for the processes of gathering and developing lecture notes for the students which the lecturer require to execute their operations. In this regard, the institutions have to make appropriate plan towards acquiring the required software for such purposes. Education and reference software being examples of application software can be used in libraries and information centers environment for teaching and learning, referencing of library materials, and reference management of information resources.

(v) Graphics software: The graphic software permits individual and organisations to manage and decide on when best variations in the graphic data and images could be used for the purpose of illustration as envisaged in the organisation. The position of the editor is very crucial in this regard in order to make use of the graphic software. Some examples of the software in question are the adobe Photoshop and Paint Shop used as graphic software. Graphic software being examples of application software can be used in libraries and information centers environment for training, media players, integrated library systems, used by OPAC, design of library websites and storage of electronic information resources in institutional repository.

(vi) Spreadsheet software: The spreadsheet software is another form of software that is used to achieve controls of items in the organisations by individuals. This type of software helps to store data and information using the table arrangement. The interconnecting part, known as cells, are detached in order to describe the part that require its use in the form of text, year, period, and numbers. It permits the operator to deliver formulations and occupations which could help complete the task. Microsoft Excel is an example of the spreadsheet software.

(vii) Database software: Database software help to generate and accomplish different database. The database takes the form of Database Management System that support individual to sharpen your information and data. In this case, it can be used for the operation of different applications, such as to collect data and information in the database. Further modification and storage be also be carried out in the databases. Some of those databases consist of Oracle, MySQL, Microsoft SQL Server, PostgreSQL, MongoDB, and IBM Db2.

(viii) Word processing software: The word processing software is a very common software mostly used across the world for diverse processing of articles/paper writing and office task. The word processing software became so peculiar due to the nature of task that must be attended to. In the word processing software, there are processing and operation of text, which are created into notes, literatures, messages, and brochures. The word processing software uses different format to perform its own task. It offers the individual using it the ability and features to do so many things such as the use of vocabulary, other word and antonyms. The features comprise of insert, file, word Art, font choices, design, references, mailing, review, and layout among many others.

(ix) Simulation software: Simulation software are that software mostly used in the background of education, video games, sciences, engineering, analysis of symbol. The areas where it is mostly applied are

definite system that may be dangerous due to its unacceptable and inaccessibility. What is obtainable in the simulation software is the program which allows someone to learn or perceive procedure, or sensation from end to end of the simulation that is devoid of completing the task. Some examples of simulation software are associated in the study of robotics, flight systems and weather forecast.

(x) Freeware: The freeware is a software that is used do many things but you might not be able to do any modification or changes to the work you have created except a fee might be required of you to do so on the internet. Some of the freeware are adobe Reader and Skype. They are obtaining free from the internet.

(xi). Shareware: The shareware software is experimental software that are used for temporary time such that, the users can see how it work or being operated. It is given out to use for a limited period. The expectation regarding this shareware is that, when users want to make use of it further, they are required to pay a certain amount of fees before access for continual use is granted. The WinZip and Adobe Acrobat are good examples.

(xii). Open source: The open source is another type of software that is available based on source code for its use. The code enables the user or individual to adjust the software, and even enhance the features of the software. This type of open source could require you to pay or not, depending on what you want to use it for. Moodle and Apache Web Server are good cases of the open source.

(xiii). Closed source: The closed sources are similar to the open source but the only difference is that, this one is closed. Most software used today is linked to this package because you are required to pay for their accessibility when you purchase them. Many of the software which we buy today in the market place are in this class. These are frequently paid for because it is someone intellectual property rights and patents that coded before it can be used. They come with controlled usage.

Guru99 (2021) and Sreejith (2020) state that among other application software which are used for different work operations are:

- Utility programs
- Generic programs
- Integrated programs
- Specific software
- Bespoke software
- Word processing software
- Desktop publishing software
- Spreadsheet software

- Database software
- Presentation software
- Internet Browsers
- Email Programs
- Graphic Programs (Pixel-based)
- Graphic Programs (vector-based)
- Communication software: Communication through audio, video or chat-based means

Guru99 (2021) also made mentioned of the following types of application software and they are as follows:

- Word-processing software
- Spreadsheet software
- Database software
- Graphics software
- Education software
- Entertainment software

Guru99 (2021) asserts that the types of system software as it applies to operating systems are:

(i) Operating systems: Operating system software assist the individual using it to do a lot of tasks, such that, you could navigate within the system, use it to accomplish task where some features are required. The use of the operating cannot be overemphasized because of the varieties of job it is capable of doing. This is also dependent on the support of the effectiveness of the hardware and software components.

(ii) Programming language translators: The programming language translator helps with the translation of inputted program into the system with the language which the system understands. The translation become much better and understandable for workability when the user had already arranged the developers based on the programming language that such task requires, because every task with its different languages and way of interpretation before the task is inputted into the system.

(iii) Communication Software: The communication software permits the user to allocate information and data before the programs is executed in the computer system and there is communication from one system to another through connectivity.

(iv) Utility programs: Utility programs are diverse conventional plans which support users during the course of using the system. There is the need to maximize preservation of tasks, considering the accomplishment of tasks that are ready to be processed on daily basis.



1. <https://www.youtube.com/watch?v=M-6WvDU9JNg>



2. <https://www.youtube.com/watch?v=Ts8hvn198mM>



3. <https://www.youtube.com/watch?v=JxkEkWpo6Vw>

4.0 SUMMARY

This unit examined what the application software and system software is all about. It went further to determine the objectives and features associated with application and system software. The types of application and system software were also considered. The understanding surrounding application and system software has to do with diversities of programs that support the computer in implementation of many tasks that were program into the computer system. Different design has been given to the applications and the application could do a number of activities such as handle text, numbers, audio, video, graphics and other task that are MS word platform. Both the application and system software are significant in the operations of diverse numbers of programs which the end-user has set out to so. The use of application and system software cannot be undermined as far the computer operating system is concerned. Without the application and system software, there is no computer that could function on their own. Meanwhile, some objectives were also mentioned that is associated with the application and system software and this comprises of the following:

- Facilitate diversities of activities
- Management of information
- Handling of data
- Fabricating visuals
- Bring together resources
- Computing figures
- Designing of task
- Information access
- Manages users' relationship with the system
- Building blocks of stored of information among many more

It is imperative to acknowledge that certain features of application and system software cannot be undermined as long the use of

computer operating system is concerned. The features aid the operating system into accomplishment of task. Among the features that the application and system software is made up of are:

- Implement task on a more generalized way
- Improves the use of programs for easy transmitting of word processing, worksheets, email, picture editing among others.
- It requires more storage space as the work or task expands
- Ability to design in a more collaborating way for flexibility to the user
- Usually transcribed in high-level language
- System Software drives every computer activity
- It is of most significant for close much relationship with the user and system
- The operation of its processing is low-level language
- The design of the system software is not easy to understand ordinarily
- Work at amazing speed
- Less interactive
- Minute in size

Although there are various types of application and system software being panacea to present day individual and organizational operation-ability. The desire to have application and system software in organization computer operating system enforces the need for transformation. Among the different application and system software known across the world for quality and efficient service delivery comprises of the following:

- Presentation software
- Web browsers
- Multimedia software
- Education and reference software
- Graphics software
- Spreadsheet software
- Database software
- Word processing software
- Simulation software
- Freeware
- Shareware
- Open source
- Closed source

Among other types of application and system software are:

- Utility programs
- Generic programs

- Integrated programs
- Specific software
- Bespoke software
- Word processing software
- Desktop publishing software
- Spreadsheet software

This was followed by other types of system software such as:

- Operating systems
- Programming language translators
- Communication Software
- Utility programs

5.0 CONCLUSION

The application and system software are indispensable for the improvement of the use of computer operating system. Without the infiltration of the application and system software into the operating system, there is no way the computer could be functional hence every computer system should be well checked whether its application and system software are up to date. Besides, the need to plan for the maintenance of the system to avoid crashing and external bodies hence inculcating antivirus is most significant. There is no library and information Centre, individual and organization that could function without the embedded application and system software. Therefore, scholars should prioritize purchasing good application and system software in their computer to advance its longevity.

Self – Assignment Exercise

Identify and discuss the various types of system software

6.0 TUTOR-MARKED ASSIGNMENT

1. Identify and discuss the various types of application software
2. How can the various types of application and system software be protected order to advance their longevity?

7.0 REFERENCES/FURTHER READING

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UNIT 2 FUNCTIONS, BENEFITS AND CHALLENGES OF USING APPLICATION AND SYSTEM SOFTWARE

CONTENTS

- 1.0 Introduction
- 2.0 Intended Learning Outcomes (ILOs)
- 3.0 Main Content
 - 3.1 Functions of Application and System Software
 - 3.1.1 Functions of Application Software
 - 3.1.2 Functions of System Software
 - 3.2 Benefits of Application and System Software
 - 3.3 Challenges of Application and System Software
 - 3.4 Distinctions between Application and System software
- 4.0 Summary
- 5.0 Conclusion
- 6.0 Tutor-Marked Assignment
- 7.0 Reference/Further Reading

1.0 INTRODUCTION

In unit 1, we discussed the history and types of Application and System software. We will go further in this unit to look at the functions, benefits and challenges of using Application and System software.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this unit, you will be able to:

- Identify the main functions of Application Software
- Discover the main functions of System Software
- Enumerate the benefits of using Application and System Software
- Describe the challenges of using Application and System Software
- Identify the differences between Application and System software

3.0 MAIN CONTENT

3.1 Functions of Application and System Software

Application and system software as already discussed are the major components of a computer system that enables it to function effectively. Their functions can be differentiated based on the purpose, operation, design and dependency on each other. The system software is intended

to manage system resources and provide a platform for the application software to function. They perform the following functions:

3.1.1 Functions of Application Software

The functions of application software vary depending on the specific application software used. Quickbase (2021) identified the basic functions of Application software to include the following: Managing information, manipulating data, constructing visuals, Coordinating resources and Calculating figures. Similarly, some of the functions of Application software include but not limited to the following:

1. It performs specific tasks for the computer user: Application Software is a programme which is written for a user to perform a particular job. For example, a user who wants to type an assignment in a word document will make use of Microsoft word which is designed specifically for that purpose.
2. It serves as a productivity/business tool: Application Software is designed to facilitate certain business functions, by improving its accuracy, efficiency, and the effectiveness of its operations. Business application software programmes achieve measurable objectives such as saving work time and enhancing productivity.
3. It assists with graphics and multimedia projects: Application Software combines both text, graphics, audio and Multimedia software in the editing of text, audio and video. This Multimedia software enhances the growth of business and entertainment.
4. It facilitates communication: Application Software allows for easy communication between the user and the computer.
5. It supports household activities such as personal business and education: Application software can assist individuals in promoting their business and in enhancing educational facilities.

3.1.2 Functions of System Software

According to Smith (2018) the system software performs the following functions:

1. Allocating System Resources: The operating system directs the traffic inside the computer, deciding what resources will be used and for how long.
2. Time Management: Time in the CPU is divided into time slices which are measured in milliseconds. Tasks can be assigned priorities so that high priority (foreground) tasks get more time slices than low priority (background) tasks. For example, each task the CPU performs is assigned a certain number of time slices. When time expires, another task gets a turn. The first task must wait until it has another turn.

3. **Memory Management:** Memory is managed also by the operating system. This includes disk space as part of main memory. While it is slower to put data on a hard disk, it increases the amount of data that can be held in memory at one time. When the memory chips get full, some of the data is paged out to the hard disk.
4. **Input and output management:** Flow control is also part of the operating system's responsibilities. The operating system manages all requests to read data from disks or tape to printers. For example, When a user clicks the mouse while the web cam is streaming, the operating system must control what happens and when.
5. **Manages system performance:** The operating system manages System performance which includes response time (how long it takes for the computer to respond when data is entered) and CPU utilization (comparing the time the CPU is working to the time it is idle).
6. **Manages system security:** Some system security is part of the operating system, though additional software can add more security functions. An administrator must set up the permissions list of who can have access to what programmes and what data.
7. **File and disk management:** An operating system comes with basic file management commands which keep track of files.

3.2 Benefits of Using Application and System Software

Baker (2019) identified the benefits of using Application and System software to include:

1. **They meet the exact needs of the user:** Since they are designed specifically with one purpose in mind, the users know that they have to use one specific software to accomplish their task.
2. **The threat of viruses invading custom-made applications is very small:** This is because any business that incorporates it can restrict access and can come up with means to protect their network as well.
3. **Licensed application software gets regular updates from the developer for security reasons.** Additionally, the developer also regularly sends personnel to correct any problems that may arise from time to time.

3.3 Challenges of Using Application and System Software

It is expensive to develop: Developing application software designed to meet specific purpose can prove to be quite costly for developers. This can affect their budget and their revenue flow, especially if too much time is spent developing software that is not generally acceptable.

They are not compatible: Some software that is designed specifically for a certain business may not be compatible with other general software. This is something that can prove to be a major stumbling block for many corporations.

It is time consuming: Developing them is something that takes a lot of time, because it needs constant communication between the developer and the customer. This delays the entire production process, which can prove to be harmful in some cases.

It poses as a threat to the computer: Application software that is used commonly by many people, and then shared online, carries a very real threat of infection by computer virus or other malicious programmes.

3.4 Distinctions Between Application and System Software

There are many distinctive factors between Application software and System software. Some of them include:

- System software operates an operating system while Application software is used in performing tasks.
- Application software is installed by the user with regards to their needs while System software is installed when an operating system is installed into a computer.
- The users do not interact with the system software but with the Application software
- Application software depends on the System software to function properly but the System software can run independently.

According to Shivam (2020), the difference between System software and Application software can be summarized as follows:

S/N	System software	Application software
1	It is the kind of software which is the interface between the application software and the system	It is the kind of software which runs according to the user
2	This kind of software is written in low level language	This kind of software is written in high level language

3	It is used for operating computer hardware	It is used by the users to perform any specific tasks they want
4	System software is hardware so they are not in interaction with the user	Users can interact with this as this user interaction is needed at each and every point
5	This is installed on the computer when the operating system is installed	Users can install them as according to their choice
6	This can run independently	This cannot run independently. They need the presence of system software
7	Example-bugger compiler etc.	Example- word processor, media player etc.

Similarly, Digitalworld839 (2021) identified eight (8) key differences between Application software and System software. They include:

Basis of comparison	System Software	Application Software
1. Definition	The system software is designed to control, integrate, and manage the individual hardware components and application software of a computer system.	Application software is the set of computer programs installed in the user's system and designed to perform a specific task.
2. Language Level	These software programs are written in low-level languages to interact with hardware at a primary level, like assembly language.	While application software is written in a high-level language like Java, .net, C++, etc.
3. Installation Purpose	It is used as general-purpose software basically for operating hardware components of the computer.	It is installed for the specific purpose as per the desired requirements of the user.

<p>4. Operation</p>	<p>System software operates the system in the background until the shutdown of the Computer.</p>	<p>However, application software runs in the front end according to the user's request.</p>
<p>5. Interaction</p>	<p>Here, System software has no interaction with users. System Software serves as an interface between hardware and end-users.</p>	<p>Here, Application software is the software that connects or performs as an intermediary between the user and the computer.</p>
<p>6. Nature of Software</p>	<p>The programming of System Software is complex than application software.</p>	<p>While the programming of application software is more manageable as compared to system software.</p>
<p>7. Dependency</p>	<p>System software runs independently, without depending on application software, As it provides platforms to application software.</p>	<p>Application software is dependent on system software because they need a platform like a system software for their functioning.</p>
<p>8. Examples</p>	<p>Assemblers, drivers, debuggers, and compilers are examples of system software.</p>	<p>Microsoft Office, Photoshop, web browser, and media player are examples of application software.</p>

4.0 SUMMARY

In this unit we have discussed the functions of application and system software, the benefits and the challenges of using application and systems software.

We explained that Application and system software are the major components of a computer system that enables it to function effectively. Their functions can be differentiated based on the purpose, operation, design and dependency on each other. The system software is intended

to manage system resources and provide a platform for the application software to function.

We identified functions of Application software to include:

1. **Allocating System Resources:** The operating system directs the traffic inside the computer, deciding what resources will be used and for how long.
2. **Time Management:** Time in the CPU is divided into time slices which are measured in milliseconds. Tasks can be assigned priorities so that high priority (foreground) tasks get more time slices than low priority (background) tasks. For example, each task the CPU performs is assigned a certain number of time slices. When time expires, another task gets a turn. The first task must wait until it has another turn.
3. **Memory Management:** Memory is managed also by the operating system. This includes disk space as part of main memory. While it is slower to put data on a hard disk, it increases the amount of data that can be held in memory at one time. When the memory chips get full, some of the data is paged out to the hard disk.

The benefits of Application and System software were enumerated as follows:

1. They meet the exact needs of the user: Since they are designed specifically with one purpose in mind, the users know that they have to use one specific software to accomplish their task.
2. The threat of viruses invading custom-made applications is very small: This is because any business that incorporates it can restrict access and can come up with means to protect their network as well.
3. Licensed application software gets regular updates from the developer for security reasons. Additionally, the developer also regularly sends personnel to correct any problems that may arise from time to time.

5.0 CONCLUSION

Application and system software are the basic components of a computer which allows it to function properly. The software helps a system to run, hence its importance. System software provides a platform for the Application software to operate. They help achieve different kinds of functions on a system thus helping to customize a system for the specific requirements and situations of the user.

Self – Assignment Exercise

Distinguish between application software and system software

6.0 TUTOR-MARKED ASSIGNMENT

1. What is the essence of Application and Systems Software?
2. List four (4) functions of Application software
3. List five (5) functions of Systems software
4. What are the challenges encountered in using Application and system software?

7.0 REFERENCE/FURTHER READING

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MODULE 4 KNOWLEDGE AND SKILLS REQUIRED FOR A COMPUTER OPERATOR AND VIRUS OUTBREAK IN COMPUTER OPERATING SYSTEM IN LIBRARIES

This module has four units which is designed to expound on knowledge, skills required for a computer operator and virus outbreaks in computer Operating Systems. Knowledge are experiences acquired overtime to enable an individual perform an activity. It is a prerequisite for operating a computer system.

- Unit 1 Overview of knowledge and skills required by a computer operator.
- Unit 2 Overview, types and features of network Operating System
- Unit 3 Virus and their types and how to restrain virus in Computer Operating System
- Unit 4 Overview, Features, Types of Micro and Mini Computers in Library and Information Work

UNIT 1 OVERVIEW OF KNOWLEDGE AND SKILLS REQUIRED BY A COMPUTER OPERATOR

CONTENTS

- 1.0 Introduction
- 2.0 Intended Learning Outcomes (ILOs)
- 3.0 Main Content
 - 3.1 Concept of knowledge
 - 3.2 Dimensions of knowledge
 - 3.3 Theories of knowledge
 - 3.4 Concept of skill and skill acquisition
 - 3.4.1 How to acquire skills
 - 3.5 Skills and competencies required for a computer operator
- 4.0 Summary
- 5.0 Conclusion
- 6.0 Tutor-Marked Assignment
- 7.0 Reference/Further Reading

1.0 INTRODUCTION

Knowledge and skills have different connotations within specific fields and even in the same discipline. Although these concepts are used interchangeably, it is pertinent to have a clear understanding of the concepts, their dimensions and steps required in acquiring them.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

By the end of this unit, you will be able to:

- Define the concept knowledge and skills.
- Understand the theories and dimensions of knowledge.
- Identify the skills required for a computer operator.

3.0 MAIN CONTENT

3.1 Concept of Knowledge

Knowledge is a term used in everyday life yet its definition is not clear. Attempts have been made by philosophers to unravel the meaning of knowledge. Plato famously defined knowledge as “justified true belief.” Merriam Webster's Dictionary (n.d) defined knowledge as "the fact or condition of knowing something with familiarity gained through experience or association". Also Davenport & Prusak (1998 p.5) sees it as a fluid mix of framed experience, values, contextual information and expert insight that provides a framework for evaluating and incorporating new experiences and information. It originates and is applied in the minds of 'knower', it is often embedded not only in documents or repositories but also in organizational routines, processes, practices and norms.

An understanding of knowledge requires a grasp of its relationship to data, information and wisdom. Data consists of discrete, objective facts or observation out of context that are, therefore not directly meaningful. Igwe, Nnadozie & Unagha (2015) defined data as facts, raw statistics or observation, which are unorganized and unprocessed data is made up of numbers, symbols, figures and alphabets which have no meaning or value unless they are converted into information by analysis. In other words, data involves facts and figures which relay something specific, but which are not organized in any way and which provide no further information regarding patterns or context. In summary data is unstructured, un-interpreted or unrefined facts and figures that may not have impact, unless subjected to meaningful process to become information.

For data to be become information, it must be contextualized, categorized, calculated, interpreted, organized and condensed. Information paints a bigger picture, this entails that information is data with relevance and purpose having undergone some degree of processing. The concept of information can be summarized by noting that information resides in messages; it is processed data that makes decision making easier; it is data that is placed into a form that is

accessible, timely and accurate. Information is transformed into knowledge.

Wisdom on the other hand is knowledge and experience needed to make sensible decisions and judgments or the good sense shown by the decisions and judgments made. Wisdom is not always a product of education but of the lifelong attempt to acquire it through interaction and socialization. From broader perspective wisdom is the application of intelligence and experience towards the attainment of a common good. The relationship among data, information knowledge and wisdom is seen in the diagrams below:

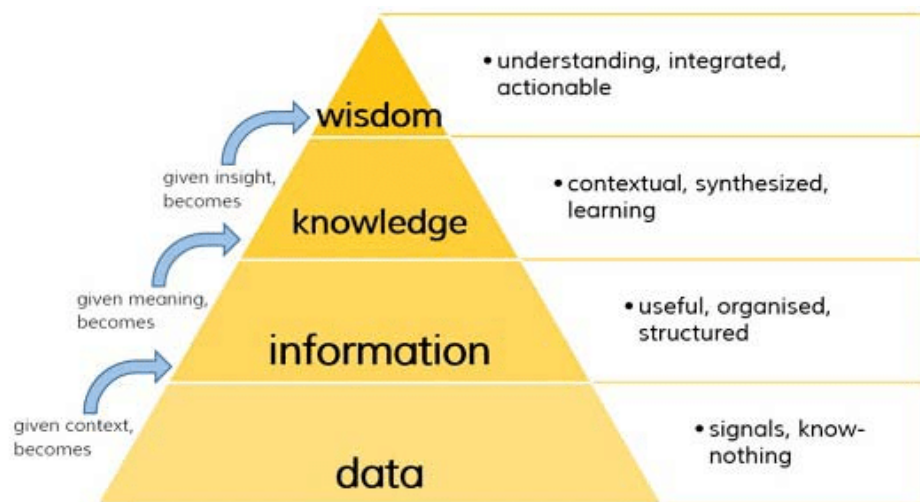


Fig 53: Pyramid of knowledge
 Source: www.researchgate.net/publication/313020352_Think_big_learning_contexts_algorithms_and_data_science/figures?lo=1

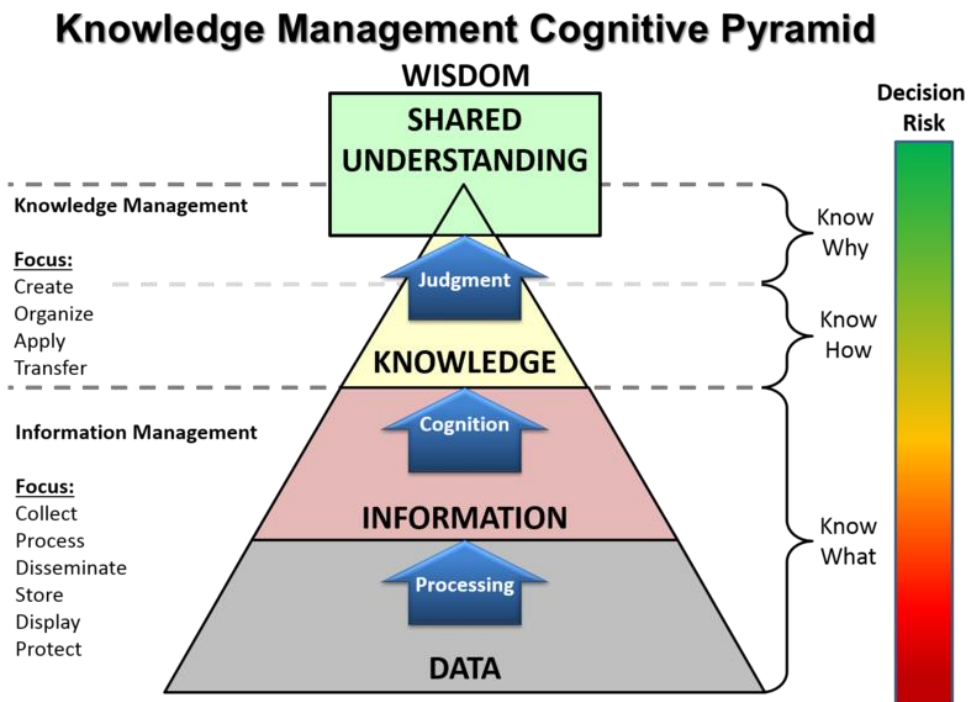


Fig 54: Knowledge Management pyramid
 Source: <https://www.pinterest.com/pin/506584658075677441/>

Having seen the pyramids descriptions involving data, information, knowledge and wisdom, we can focus our attention on knowledge. However, the need to have a clear distinction between information and knowledge should not be overlooked notwithstanding the close relationship between the two concepts.

Distinction between knowledge and information

S/N	Knowledge	Information
1.	Knowledge is what an individual possessed after assimilating facts and putting them into context	Information can be said to be knowledge shared by having communicated
2.	Knowledge is a dynamic and active resource mostly residing in peoples head	Information is passive in nature
3.	Knowledge is highly valued because it is closer to action	Information on its own does not make decisions
4.	Knowledge is intangible	Information is tangible
5.	Knowledge resides in the user which happens when human experience is applied to information and data	Information is refined data that has evolved to the point of being useful for some form of analysis

3.2 Dimensions of Knowledge

Over the years many attempts have been made to classify knowledge on different dimensions. This has resulted in numerous classifications and distinctions based on various disciplines. There are dimensions and variations associated with knowledge these dimensions see knowledge as emanating from angles with variation in classification. Some of the classifications of knowledge are:

1. **Procedural knowledge versus Declarative knowledge:** Procedural Knowledge also known as interpretive knowledge is the type of knowledge which explains how a particular task can be completed. It emphasizes steps taken to achieve an objective example flow charts, installation manuals, procedure manuals etc. Declarative knowledge is announcing the existence of something. It is seen as substantive knowledge that focuses on beliefs about relationship among variables. For example, the earth is spherical in shape.
2. **Tacit knowledge Versus Explicit knowledge:** The word 'tacit' means hidden. This classification of knowledge deals with the kind of knowledge that is hidden from the consciousness of the knower. It emanates from personal experiences of the knower which resides in the human brain. However, it is difficult to capture or codify tacit knowledge. Explicit knowledge on the other hand refers to knowledge that can be captured or codified. Such as that knowledge found in documents. This classification of knowledge is sometimes referred to as know-what, it is very easy to identify, store and retrieved.

Distinction between Tacit knowledge and Explicit knowledge

Tacit knowledge	Explicit knowledge
Personal knowledge embedded in individual	Fact based, publicly available and beyond dispute.
Experience and involving such intangible factors as personal belief, perspective and values.	Possibly recorded in documents, also includes scientific and technical knowledge, common understandings, the 'right way of doing things' and socially accepted norms.
Informal, action and discourse orientated	Easily verbalised, and stated in the form of rules or notes. Includes knowledge of organizational structures, business rules, etc
Acting with rather than acting on.	Easier to deal with in ICT developments as it is easily articulated, communicated and represented in formal languages.
Real key to getting things done	Formalised

Source: <https://www.semanticscholar.org/paper/Tacit-vs.-explicit-knowledge-the-current-approaches-Olomolaiye-Egbu/f44058c34ff507e59e65c3262beb9d5c0d501a79>

3. **Technically-specific knowledge versus Contextually-specific knowledge:** Technically-specific knowledge is the knowledge an individual possesses in a specific field of study or domain. It is made up of specialized skills required to complete a task. Such skills or competencies are held by a few people. For example, use of mechanical equipment, information technology etc. Contextually-specific knowledge refers to the kind of knowledge that depends on the circumstance of time and place in which the task is to be performed. This kind of knowledge can be held by an old and experienced staff member who has worked in an organization for a very long time.
4. **General knowledge versus Specific knowledge:** General knowledge is the kind of knowledge that is common to everyone. Such knowledge is readily available and people are willing to share it easily. It can be gathered over a period of time through different medium or experience. For example, operating Microsoft windows of a computer. Specific knowledge is the kind of knowledge possessed by a very limited number of individuals and it is difficult to transfer. Most people are unwilling to share this type of knowledge for fear of losing whatever privilege or advantage it confers on them. It is opposite of general knowledge. It can either be technical or contextually specific.

3.3 Theories of Knowledge

Theory of knowledge focuses on capturing what it means to "know". Its concern is not particularly on subject area or field but on the pursuit of a more conceptual idea of what is required in acquiring knowledge and on how to apply knowledge to real life situations. Axel (2016) identified six (6) theories of knowledge to include:

1. **Logical Positivism:** Logical positivism is a philosophical movement that arose in Vienna in the 1920s and propounded by Hans Reichenbach.



Fig 55: Source: Standfort Encyclopaedia of Philosophy, (2021)

This theory is also known as logical empiricism. It asserts that only statements verifiable through direct observation or through logical proof are meaningful in terms of conveying truth value, information or factual content. It also holds that traditional metaphysical doctrine can be rejected as meaningless because scientific knowledge is the only factual knowledge. This means that a statement can only be meaningful if they are verifiable through observation or capable of empirical verification.

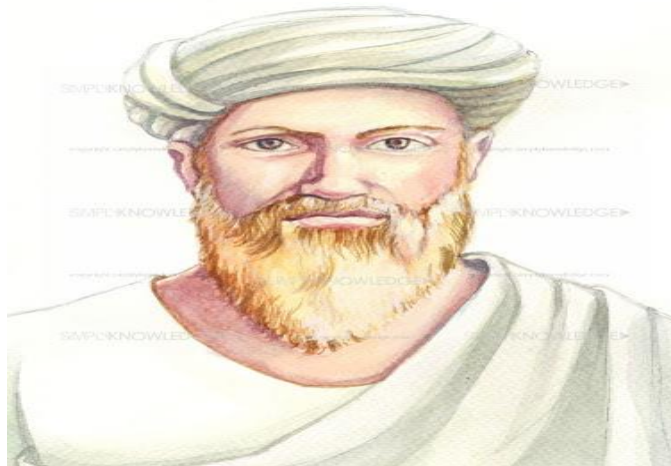
2. **Relativism:** The 18th-century philosopher David Hume (1711–1776) serves in several ways as the father both of modern emotivism and of moral relativism.



Fig 56: Source: Portrait of David Hume (1711-1776), 1766
<https://www.the-tls.co.uk/articles/david-hume-footnotes-to-plato/>

Relativism posits that knowledge is relatively valid to a specific context, society, culture or individual. It comprises of the perception that truth, right and wrong, standards of reasoning, and procedures of justification are the products of changing norms and cultural frameworks, and that their authority or relevance is confined to the context that produced them. This means that knowledge is confined to the society, culture or individual where it emanates. For example, theory posits that before a judgment is passed, the context and the circumstances surrounding an action must be verified.

3. **Ontological Realism:** The term is ontology is generally credited to the great Ionian mathematician, scientist, and religious mystic Pythagoras who lived circa 570 BCE.



Fig

57:

Source:

<http://simplyknowledge.com/popular/biography/pythagoras>

Ontological realism focuses on ontologies that were created to promote consistence in the ways scientific results are described for a more effective integration of scientific data. It is a term that is used for theories that regards what is real.

4. **Post Modernism:** Jean-François Lyotard is credited as the first to use the term in 1979 in his work: **The Postmodern Condition: A Report on Knowledge**.

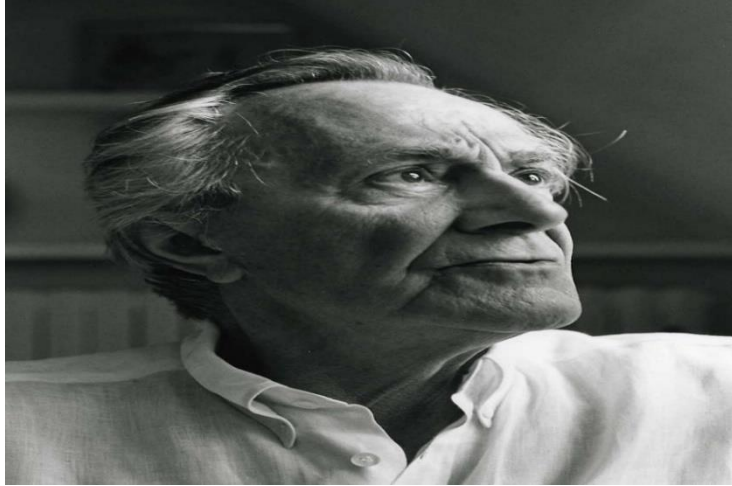


Fig 58: Source: https://en.wikipedia.org/wiki/Jean-Fran%C3%A7ois_Lyotard

Postmodernism focuses on the unsteadiness of all things and on how to create realities. Postmodernists highly reject the knowledge position of reason and other human knowledge tools and hold no value for natural and intrinsic values; because basically, they consider all realities and values including human nature and his innate values as being fluid and constructed by social and external factors (Forghani, Keshtiaray, & Yousefy, 2015). It believes that concepts like knowledge and truth are a product of unique systems which are contextual and constructed. For example, postmodernism questions the morality of being unfaithful to a partner.

4. Social Constructivism: Social constructivism was developed by Lev Vygotsky in 1934



Fig 59: source of knowledge

It is a sociological theory of knowledge which focuses on how human development is viewed from social perspective and how knowledge is built up through human interactions with others. It believes that as people work together in an organization they create and share knowledge among them. It also believes that individuals are solely responsible for constructing their knowledge as learn and interact in a group. For instance, students learn primarily through interactions with their peers, teachers, and parents, whereas teachers stimulate and facilitate conversation through harnessing the natural flow of conversation in the classroom (Powell & Kalina, 2009).

5. **Scientific Realism:** Scientific realism was sharpened in 1980 with a book written by Bas van Fraassen.



Fig 60: Source: <https://www.princeton.edu/~fraassen/cv/>

Scientific realism believes that scientific knowledge independently exists in the minds of scientist. It also believes that scientific theories are true and are real entities in the world.

3.4 Concept of Skill and Skill Acquisition

Historically, the term 'skill' is used to refer to the manual craft worker and technologist. However, thefreeonline dictionary (2021) is defined it as the proficiency, facility or dexterity that is acquired or developed through training or experience. Also Further Education Unit (1982), defined is as "the ability to perform a specific manipulative occupational task' and which now embraces: Language (reading, writing, speaking and listening); number (calculation, measurement, graphs and tables); manipulative dexterity and co-ordination; problem solving; everyday coping, interpersonal relationships; computer literacy and learning". It serves as the bridge between knowledge and performance. Skill could also be seen as an instrument through which humans control their knowledge effectively in order to improve their performance. It is strengthened through knowledge which helps an individual to perform better.



Fig 61: Source: <https://guardian.ng/saturday-magazine/the-skill-revolution/>

Skills change over time; some skill become irrelevant overtime as new skills emerge and this will continue as businesses tries to be more innovative and competitive. Felstead et al. (2002) ascertains that people coming from different backgrounds perceive skills differently, for example in economics the workforce is regarded as a human capital and investment in skills in the same way as physical capital should yield positive results; whereas in sociology skills are more regarded in the social context as a status. This notwithstanding, different types of skills has been identified by various authors. SKILLSCAN (2012) identified three types of skill to include: Transferable/Functional, Personal Traits/Attitudes, and Knowledge-based. The table below provides a description and examples of each skill type.

SKILL TYPE	DESCRIPTION
Transferable/Functional	<p>Actions taken to perform a task, transferable to different work functions and industries</p> <p>Based on ability and aptitude</p> <p>Expressed in verbs</p> <p>Examples:</p> <ul style="list-style-type: none"> ➤ Organize ➤ Promote ➤ Analyze ➤ Write
Personal Traits/Attitudes	<p>Traits or personality characteristics that contribute to performing work</p> <p>Developed in childhood and through life experience</p> <p>Expressed in adjectives</p> <p>Examples:</p> <p>Patient</p> <p>Diplomatic</p>

	Results-oriented Independent
Knowledge-based	Knowledge of specific subjects, procedures, and information necessary to perform particular tasks Acquired through education, training, and on-the-job experience Expressed in nouns Examples: Personnel Administration Contract Management Accounting

Levin, Santos & Weber (2021) noted that for someone to succeed in the 21st century labour market, there is need to possess these skills:

1. **Cognitive skills:** This skill comprises of the ability to comprehend complex ideas, and adapt effectively to the environment, learn from experience, and reason. Foundational literacy and numeracy as well as creativity, critical thinking, and problem-solving are cognitive skills.
2. **Socio-emotional skills:** Which describe the ability to navigate interpersonal and social situations effectively, and include leadership, teamwork, self-control, and grit.
3. **Technical skills:** Which refer to the acquired knowledge, expertise, and interactions needed to perform a specific task, including the mastery of required materials, tools, or technologies.
4. **Digital skills:** Which are cross-cutting and draw on all of the above skills, and describe the ability to access, manage, understand, integrate, communicate, evaluate, and create information safely and appropriately?

When these skills are developed, the individual can contribute towards the structural and economic growth by ensuring that they are employable and productive in the society. Acquiring skills is very important in the life of every human. Skill acquisition has been described as the ability to be trained on a particular task or function and become expert in it. It is also the ability to learn how to do something in order to earn a living from it. Groat (2016) identified three stages of skill acquisition to include:

1. **Cognitive (Early) Stage:** In this stage, the individual needs to be intellectually aware of what s/he is doing. It requires total focus, commitment and diligence. This is often the hardest and the most exciting stage, the individual is required to follow series of steps and in most cases they are bound to make mistakes and get corrected.
2. **Associative (intermediate) Stage:** This stage is a bit painful but flexible. The individual begins to practice what is learned over time, works within the limits of his powers and adjusts approaches based on feedback from the environment.
3. **Autonomous (Late) Stage:** This is the final stage of skill acquisition. The individual can perform the skill effectively and efficiently without any need to consult anyone.

3.4.1 How to Acquire Skills

Acquiring a new skill takes a lot of time and energy, therefore there is need to set goals and split the skill procedure into smaller steps. There are several steps or methods of acquiring a new skill. Few of them are discussed below:

1. **Choose a skill that will be beneficial to you:** People tend to feel more interested in something they feel will be of more benefit to them. Hence choosing to learn a skill that will assist you in your daily life or work place will not be out of place. Skills that can improve your education and career include: public speaking, reading, speaking, data analysis cooking etc.
2. **Devote time to it:** Devote specific number of hours daily or weekly to learning the new skill. This is because learning a new skill takes a lot of practice to perfect it.
3. **Learn a Single Skill at a time:** It is important to learn a single skill at a time rather than trying to learn multiple skills at once. This is because a divided attention to a skill can extend the period of time required to master the skill. Hence it is advisable to learn the rudiment of a new skill before proceeding to learn a new one.
4. **Choose a platform that suits your learning style:** There are many platforms that are designed to assist individuals in learning new skills. Such platforms include: online tutorials, books, manuals, videos, face-to-face contact etc.
5. **Learn from an expert:** An experienced instructor is your best bet to mastering a new skill easily and quickly.

3.5 Skills and Competencies Required for A Computer Operator

Having explained knowledge, what it means to know, skill and how to acquire new skills. We will move further to look at the expected skills required to operate a computer. A computer operator is a person who is responsible for operating a computer in an establishment or organization. Computer operators work either in a data centre or a server room. They can also work remotely in work stations across different sites depending on the type of organization they are serving. Computer operators use a variety of skills and competencies to provide technical support to an organization. These skills and competencies can be divided into two (2):

- a. Technical skills
- b. Soft skills

Technical skills include:

- Knowledge of networking and monitoring of programmes
- Show of expertise in the use of an operating systems
- Knowledge of software applications- object or component oriented
- Ability to type quickly using MS word
- Possession of troubleshooting skills
- Operational knowledge of computing applications such as MS Word, MS Excel, MS PowerPoint etc.

Soft skills include

- Analytical and problem-solving skills
- Knowledge of applications user interface
- Time management and ability to maintain accurate records
- Communication skills

4.0 SUMMARY

In this unit we discussed the concept of knowledge and the skill required for a computer operator. We explained that knowledge is the fact or condition of knowing something with familiarity gained through experience or association. An understanding of knowledge requires a grasp of its relationship to data, information and wisdom. Data is defined as facts, raw statistics or observation, which are unorganized and unprocessed data is made up of numbers, symbols, figures and alphabets which have no meaning or value unless they are converted into information by analysis. Information paints a bigger picture; this entails that information is data with relevance and purpose having undergone some degree of processing. Wisdom on the other hand is knowledge and experience needed to make sensible decisions and judgments or the good sense shown by the decisions and judgments made.

Some of the classifications of knowledge are:

1. Procedural knowledge versus Declarative knowledge: Procedural Knowledge also known as interpretive knowledge is the type of knowledge which explains how a particular task can be completed. It emphasizes steps taken to achieve an objective example flow chart, installation manuals, procedure manuals etc.
2. Tacit knowledge Versus Explicit knowledge: The word 'tacit' means hidden. This classification of knowledge deals with the kind of knowledge that is hidden from the consciousness of the knower.
3. Technically-specific knowledge versus Contextually-specific knowledge: Technically-specific knowledge is the knowledge an individual possesses in a specific field of study or domain.
4. General knowledge versus Specific knowledge: General knowledge is the kind of knowledge that is common to everyone.

We also looked at the theory of knowledge which focuses on capturing what it means to "know". Its concern is not particularly on subject area or field but on the pursuit of a more conceptual idea of what is required in acquiring knowledge and on how to apply knowledge to real life situations.

We also explained the concept of skill which is defined it as the proficiency, facility or dexterity that is acquired or developed through training or experience. Three types of skill were identified to include: Transferable/Functional, Personal Traits/Attitudes, and Knowledge-based. Acquiring skills is very important in the life of every human. Skill acquisition has been described as the ability to be trained on a particular task or function and become expert in it. Acquiring a new skill takes a lot of time and energy, therefore there is need to set goals and split the skill procedure into smaller steps.

There are several steps or methods of acquiring a new skill. Few of them are discussed below:

1. **Choose a skill that will be beneficial to you:** People tend to feel more interested in something they feel will be of more benefit to them. Hence choosing to learn a skill that will assist you in your daily life or work place will not be out of place. Skills that can improve your education and career include: public speaking, reading, speaking, data analysis cooking etc.
2. **Devote time to it:** Devote specific number of hours daily or weekly to learning the new skill. This is because learning a new skill takes a lot of practice to perfect it.

3. **Learn a Single Skill at a time:** It is important to learn a single skill at a time rather than trying to learn multiple skills at once. This is because a divided attention to a skill can extend the period of time required to master the skill. Hence it is advisable to learn the rudiment of a new skill before proceeding to learn a new one.
4. **Choose platforms that suit your learning style:** There are many platforms that are designed to assist individuals in learning new skills. Such platforms include: online tutorials, books, manuals, videos, face-to-face contact etc.
5. **Learn from an expert:** An experienced instructor is your best bet to mastering a new skill easily and quickly.
We explained expected skills required to operate a computer and defined a computer operator as a person who is responsible for operating a computer in an establishment or organization. Computer operators use a variety of skills and competencies to provide technical support to an organization. Some of these skills and competencies include:
 - Show of expertise in the use of an operating systems
 - Knowledge of networking and monitoring of programmes
 - Knowledge of software applications- object or component oriented
 - Analytical and problem-solving skills
 - Operational knowledge of computing applications such as MS Word, MS Excel MS PowerPoint etc.
 - Knowledge of applications user interface
 - Time management and ability to maintain accurate records
 - Ability to type quickly using MS Word
 - Possession of troubleshooting skills
 - Communication skills

5.0 CONCLUSION

Knowledge and skills play a crucial role in personal development of an individual. They assist an individual to perform optimally in the society. Knowledge is the garnered through experience, available information and insights provided by experts. An understanding of knowledge requires a grasp of its relationship to data, information and wisdom. Skill on the other hand is the ability to perform specific tasks successfully. It serves as the bridge between knowledge and performance. It is strengthened through knowledge which helps an individual to perform better.

Self – Assignment Exercise

List and explain four (4) classification of knowledge

6.0 TUTOR-MARKED ASSIGNMENT

1. Explain the concept of knowledge and its relationship with data, information and wisdom
2. What is skill acquisition?
3. List and explain four (4) theories of knowledge
4. List five (5) skills and competencies required for a computer operator

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UNIT 2 OVERVIEW, TYPES AND FEATURES OF COMPUTER NETWORK AND NETWORK OPERATING SYSTEMS

CONTENTS

- 1.0 Introduction
- 2.0 Intended learning Outcomes (ILOs)
- 3.0 Main Content
 - 3.1 Overview of the concept of computer networks and network operating systems
 - 3.1.1 Rationale for using a computer network
 - 3.1.2 Components of a computer network
 - 3.1.3 Advantages of computer network
 - 3.1.4 Application of computer network in real life scenarios
 - 3.1.5 Network topology
 - 3.1.5.1 Types of network topology
 - 3.1.6 Types of networks
 - 3.1.7 Network operating system
 - 3.2 Types of network operating system
 - 3.3 Features of network operating system
- 4.0 Summary
- 5.0 Conclusion
- 6.0 Tutor-Marked Assignment
- 7.0 Reference/Further Reading

1.0 INTRODUCTION

Networks are ubiquitous. There is no sphere of life which requires data and sharing of information that does not involve network. Similar to human networks which we are all part of, computer networks also share information and resources using specialized devices. Hence a clear understanding of the concept, types and features of network and networks in computer operating systems will no doubt enhance their use.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

By the end of this unit, you will be able to:

- Understand basic networking concepts and network operating systems
- Understand different types of network operating system
- Identify features of network operating system.

3.0 MAIN CONTENT

3.1 Overview of The Concept of Computer Networks and Network Operating Systems

According to Gregersen (2021) **computer network** is defined as when two or more computers are connected with one another for the purpose of communicating data electronically. Besides physically connecting computer and communication devices, a network system serves the important function of establishing a cohesive architecture that allows a variety of equipment types to transfer information in a near-seamless fashion. Similarly, Javapoint (2021) defined a computer network as a group of computers linked to each other that enables the computer to communicate with another computer and share their resources, data, and applications. A computer network can be categorized by their size. Also Tenenbaum (1996) defines a computer network as an interconnected collection of autonomous computers. Two computers are said to be interconnected if they are capable of exchanging information. Central to this definition is the fact that the computers are autonomous. This means that no computer on the network can start, stop, or control another.



Fig 62: Source: <https://www.inspiredtechs.com.au/computer-networking/>

3.1.1 Rationale for Using a Computer Network

The computer network can be useful in the following areas:

1. It can be used to share information among all user in the network.
For example, Network printers
2. It ensures easy communication from one computer to another
3. It eliminates the distance barrier in information sharing

4. It can be used for educational purposes
5. It ensures fast and easy exchange of data through the network

3.1.2 Components of A Computer Network

The following are some of the essential components of a computer network

1. Two or more computers
2. Cables (coaxial, twisted pair, or fibre optic) as links between computers
3. A network interfacing card (NIC) of each computer
4. Switches
5. A network operating system
6. A server
7. Nodes

3.1.3 Advantages of Computer Network

The following are some of the advantages of computer network

1. It increases speed: A network provides a fast means of sharing and transferring files
2. Security of information: It provides a secured environment for sharing information.
3. Ease of cost: Due to the prevalence of many popular versions of software, networkable software is now available at a significantly reduced cost.
4. It serves a medium of communication: Using a network assist people working far apart to share information from one end to another hence ensuing co-operation among them.

3.1.4 Application of Computer Networks in Real Life Scenarios

In recent times, data and communication networks has become an essential part of human life. They are applied in businesses, industries entertainment and other spheres of life. Some of the fields where network is useful include:

- **Sales and Marketing:** Computer network are used in sales and marketing to collect and analyse information regarding customers' demands and product supplies, reservation of hotels and airlines, processing and receiving orders.
- **Electronic Messaging:** Such as SMS, electronic mail (e-mail)
- **Financial services:** Many financial services are dependent on the use of networks. Such services include: transfer of money without visiting the bank, foreign exchange transfers, automated teller machines etc.

- **Electronic Data Interchange (EDI):** This allows documents to be transferred from one place to another without the use of paper
- **Blended Learning:** This is a combination of physical and virtual learning. Students can stay in their homes and participate in classes virtually.

3.1.5 Network Topology

A topology of a network describes the way computers are connected to each other. It is a major design consideration for cost and reliability. There are two possible ways to connect the devices. They are:

1. **Point-to-point connection:** A point-to-point connection provides a dedicated link between two devices. The number of connections grows as the number of computers increases.

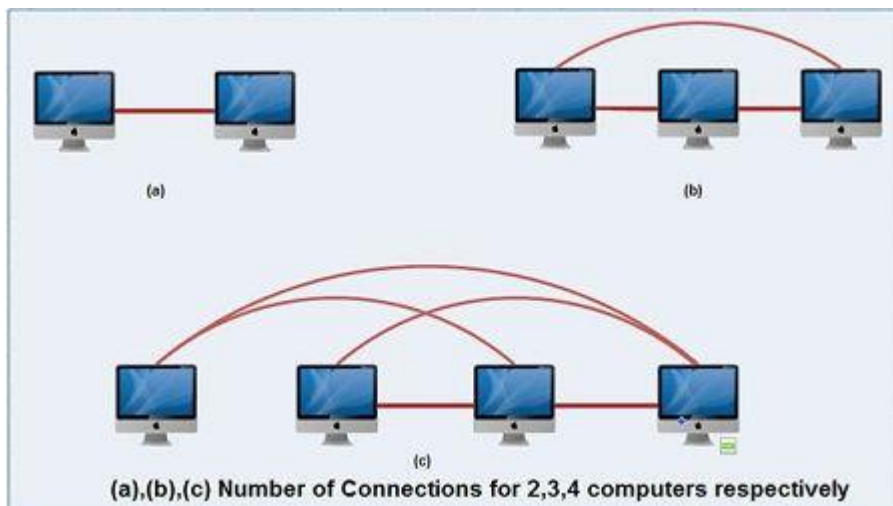


Fig 63: Source: <https://ecomputernotes.com/computernetworkingnotes/computer-network/point-to-point-connections>

2. **Multipoint connection:** A multipoint is also called a multi-drop connection. It is a connection in which more than two devices share a single link. The channel capacity is shared among the devices.

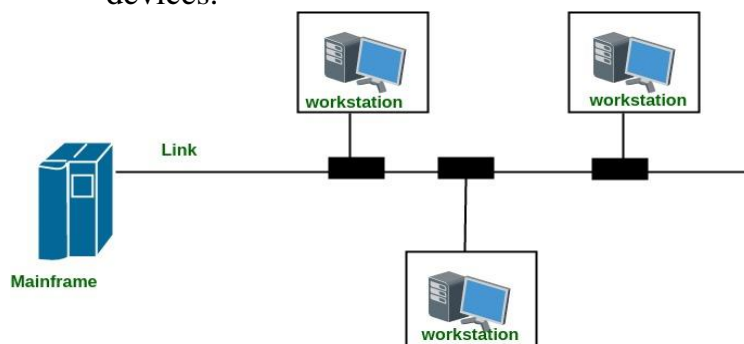
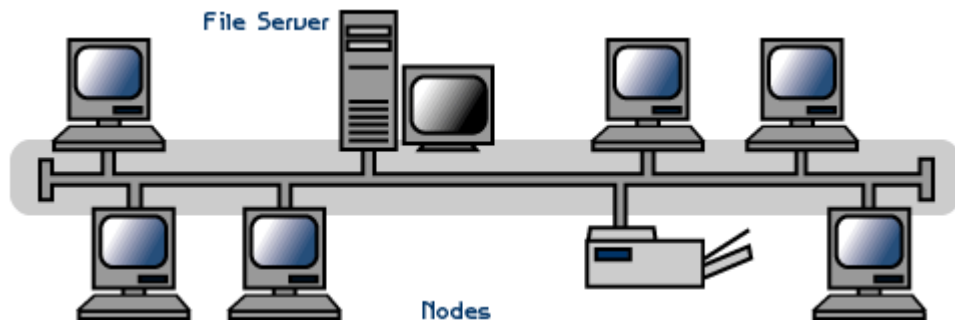


Fig 64: Source: <https://www.geeksforgeeks.org/line-configuration-computer-networks/>

3.1.5.1 Types of Network Topology

The topology of any selected network assists in the identification and the location of faults in a system it also provides a means of isolating it. There are five (5) basic network topologies. They include:

1. **Bus or Linear Topology:** A Bus topology is a multi-point connection in which work stations are connected to a single cable called a bus. It consists of nodes which are attached in a single length (normally coaxial cable).



Fig

65:

Source:

<https://fcit.usf.edu/network/chap5/chap5.htm>

In this type of topology data is sent out or broadcast in small blocks known as packets. Each packet contains a data bits and a header which bears the address. if a particular station wants to transmit data, it sends it in packets along the bus then, on identifying the address, the destination device copies the data onto its disk.

Advantages of Bus or Linear Topology

- It is easy to understand, install and use for small networks
- There is less cost required for cabling bus topology
- It is easy to expand by joining two cables with a BNC connector
- Repeaters can be used to boost and increase its distance

Disadvantages of Bus or Linear Topology

- Bus or Linear topology is slowed down by heavy network. When one computer is transmitting data, other computers have to wait till it is their turn.
- It rectifies a faulty the node at the point where it is connected, hence removing it from the connection at the centre.
- A broken cable in the connection can cause a breakdown of the whole connection.
- It is difficult to detect fault in Bus topology.

2. **Star topology:** In this type of topology, all the cables from the computer are connected to a central location in a single path. It is mostly used in data processing and voice communication.

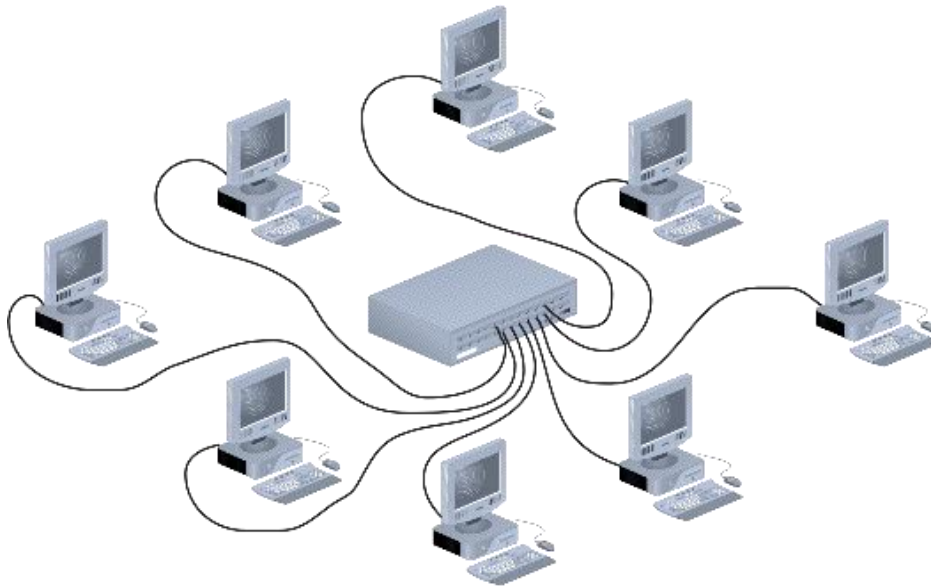


Fig 66: Source: <https://www.propatel.com/what-is-star-topology-in-computer/>

Each computer in a star network exchange information with the central hub. The central hub in turn sends information either to all the computers in the broadcast star network or only to the destination computer in a switched network.

Advantages of Star Topology

- It provides easy access for reconfiguration of the network. This is as a result of the number of the concentration points in star topology
- There is the tendency of failure in the connections points in a star network. Failure of a single network entails disconnection of other computers from the network.
- Faults are easily detected and corrected in star since all the computers are connected to a single hub.
- It ensure easy access to protocols

Disadvantages of Star Network

- Failure of the central hub results in the failure of the entire network
- It requires a device at the central hub to rebroadcast or switch the network traffic
- It is difficult to add new computers in a star topology.
- It requires large number of cables since all the computers are connected to the hub,

3. **Mesh Topology:** In a mesh topology, every computer has a dedicated point to point link to every other computer. The link carries traffic only between computers it connects.

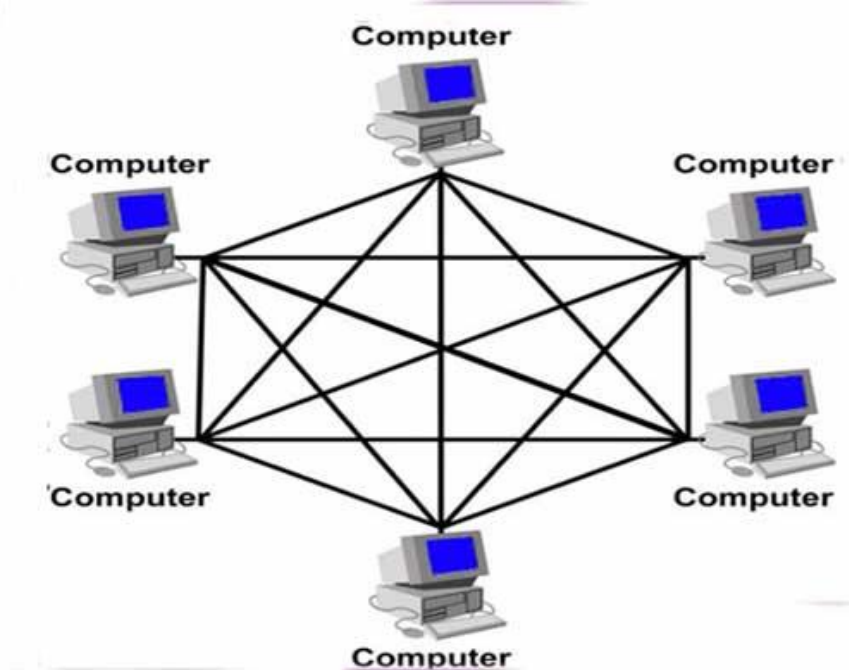


Fig 67: Source: <https://snabaynetworking.com/mesh-topology-and-its-advantages-and-disadvantages/>

Advantages of Mesh Topology

- Each connection carries its own data load thereby reducing traffic issues. This is guaranteed with use of dedicated links.
- The use of dedicated lines ensure data security and privacy
- Faults are diagnosed easily with the use of point to point connection
- It is robust because failure of one computer does not affect other computers

Disadvantages of Mesh Topology

- Installation and configuration in mesh topology is difficult since every computer must be connected to every other computer.
- It is expensive to maintain
- The cost of cabling is more

4. **Tree Topology**

Tree topology is a variation of star topology. Computers in tree topology are connected to a central hub which controls the traffic to the network. It has a hierarchy which looks like the branches of a tree. This means that all the computer are not connected to the central hub, many of them are connected to a secondary hub which in turn connects to the central hub.

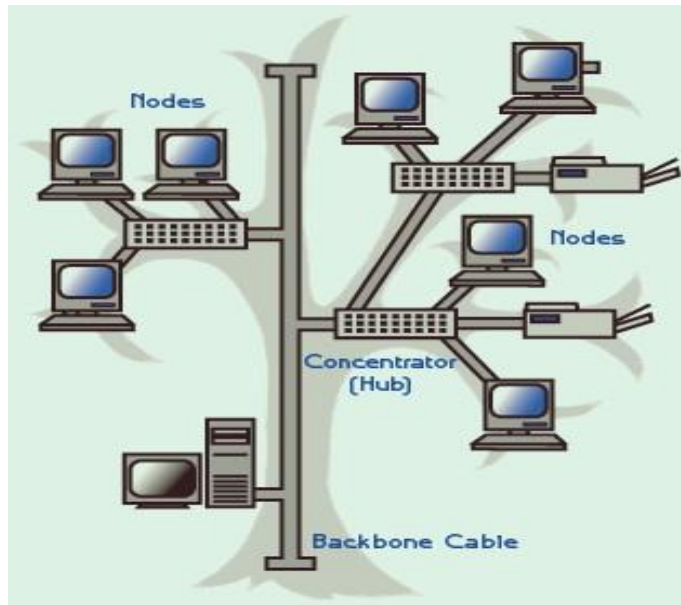


Fig 68: Source:<https://www.itrelease.com/2019/06/what-is-tree-topology-with-example/>

Advantages of Tree Topology

- i. More computers are connected to a single hub. This ensures increase in the distance a signal can travel between computers
- ii. The network isolates and prioritizes communication between computers

Disadvantages of Tree Topology

- iii. Failure of the central hub means that the entire system will fail
- iv. The cost of cabling is more

5. Ring or Circular Topology

Ring or circular topology is a multipoint communication network which allows computers to be connected in a series to form a closed loop of circle. Each loop is joined by a point to point connection to two other stations (a Transmitter and a Receiver). Data is received from one computer and it is transmitted to another computer, hence data travel in one direction only around the ring until it gets to the sender which in turn discards it.

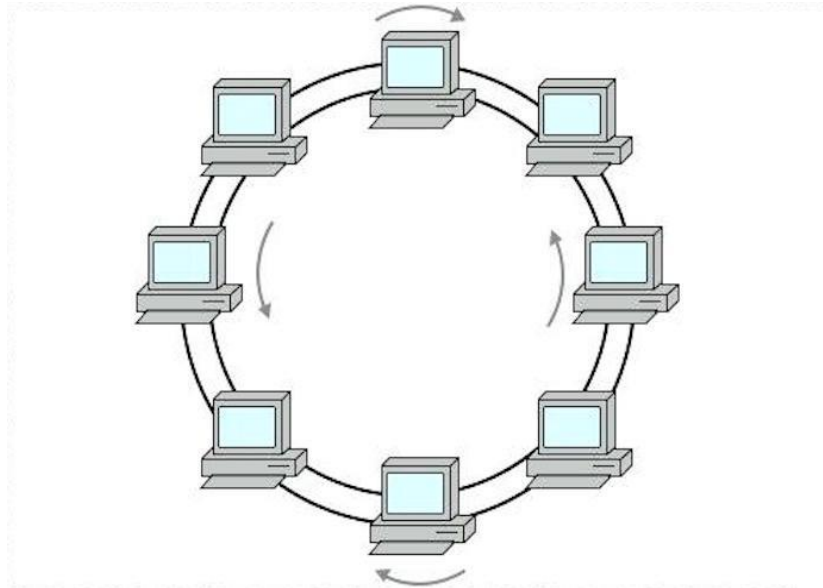


Fig 69: Source: <https://www.itrelease.com/2019/06/what-is-ring-topology-with-example/>

Advantages of Ring Topology

- i. Monopoly of network is restricted because every computer is given equal access to the token
- ii. Ring topology is suitable for optical fibres
- iii. It require less cabling like the bus topology

iv. Disadvantages of Ring Topology

- v. Failure of one computer affects the entire system
- vi. It makes troubleshooting difficult
- vii. Network reconfiguration is also difficult

3.1.6 Types of Networks

In this section we will discuss various categories in which networks are classified. The distance between computers that are connected to a network determines a network type. There are five (5) types of networks, they include: Local Area Network (LAN), Wide Area Network (WAN), Metropolitan Area Network (MAN), Wireless Networks and Internet.

1. **Local Area Network (LAN):** This is the type of network that is designed to function over a small physical area such as offices, homes etc. It is widely used in a variety of applications. In the library, it can be used to connect a small number of computers which share information with one another.



Fig 70: Source: <https://techterms.com/definition/lan>

They are easy to design, maintain and troubleshoot. Information sharing among computers is easy because all the computers are connected in a single cable topology such as Ring, Bus, Star and Tree are used in LAN.

2. **Metropolitan Area Network (MAN):** This type of network is a bigger version of LAN and uses the same technology as LAN. It is designed to extend over an entire city. It can be a single network and it can also serve as a means of connecting a number of LANs to a larger network. A typical example of MAN could be seen in universities, government buildings and residential areas which connect to each other over the network. Libraries can also use MAN to share and create access to information resources over the network.

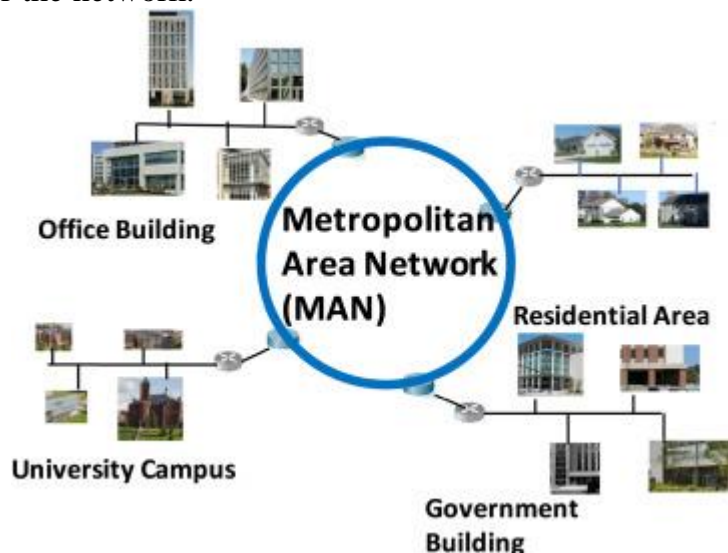


Fig 71: Source: <https://www.sciencedirect.com/topics/computer-science/metropolitan-area-networks>

MAN can be owned and operated by private companies or it can be a service provider by a public company such as telephone companies etc.

3. **Wide Area Network (WAN):** In this type of network, computers are connected to each other at a widely separated location. It might be within a country, continent or the whole world. They are basically a packet switching networks.

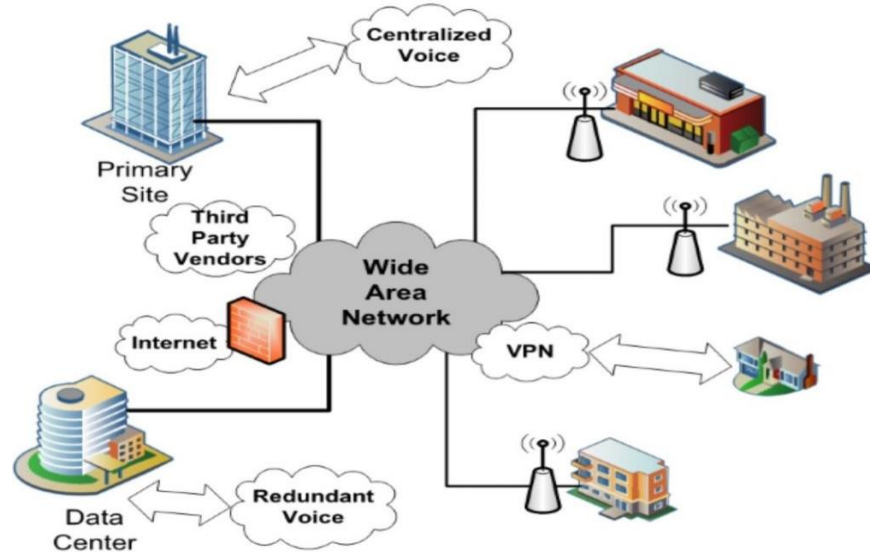


Fig 72: Source: itrelease.com/2018/07/advantages-and-disadvantages-of-wide-area-network-wan/

Most WANs are used for transferring large blocks of data between users. The time it takes for data transfer is not a critical parameter because the data is from an already existing records or files. They are mostly not used for real time applications.

4. **Wireless Network:** Wireless networks are becoming increasingly used in everyday life. It is the type of network whereby computers are connected to each other using a wireless data connection.



Fig 73: Source: <https://www.cablefree.net/wirelesstechnology/wireless-lan/>

It can be used in distant buildings and areas, examples of wireless networks include telephone networks, Bluetooth connections, hotspot tethering, satellite communications etc.

5. **The internet:** The internet is a collection of networks located all over the world and connected by gateways. The gateway accepts information from the source network and checks its routing to see its destination.



Fig 74: Source: <https://www.stambol.com/2018/12/03/the-future-of-the-internet-of-things/>

3.1.7 Network Operating Systems: A network operating system (NOS) is a computer operating system that is intended to support computers connected to a LAN such as personal computers, workstations to enable them share and communicate with each other.

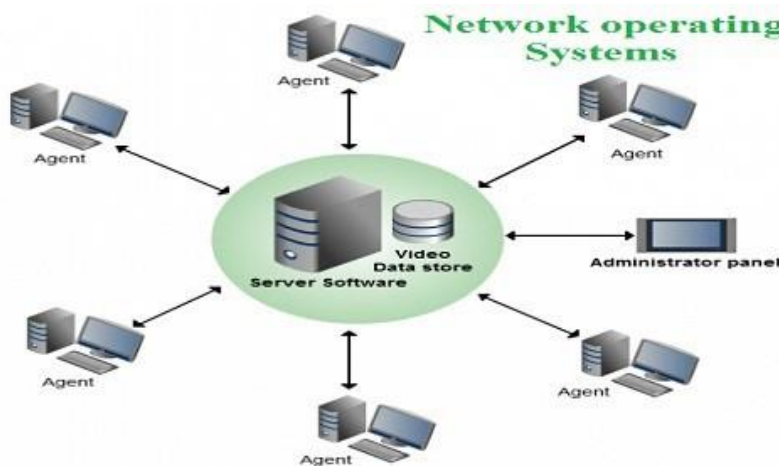


Fig 75: Source: <https://medium.com/@blogstevej327stuff/what-is-network-operating-system-16a73eda23f9>

It is widely used in Microsoft Windows server, Novell open enterprise server and UNIX (TechnologyUK, 2021). It assists individual computers to perform and process operations which can either run on the same or different operating system. Network operating system uses a server programme which is capable of providing security, manages data and other functionalities in a network.

Advantages of Network Operating systems

- i. It can effectively create and manage user accounts.
- ii. It facilitates the sharing of resources in the sever.
- iii. It assists in providing back up for the computers.
- iv. It monitors and manages the use of the network.

- v. It assists in troubleshooting the network.

List of Network Operating systems

This following is a list of network operating systems available for use

S/N	Network Operating System	Features
1	Stratum	Supported by a broad spectrum of organizations from across the networking industry. Stratum exposes a set of next-generation SDN interfaces including P4Runtime and OpenConfig, enabling interchangeability of forwarding devices and programmability of forwarding behaviors.
2	Cumulus Networks	Cumulus Linux is a Debian based Linux distribution that runs on a variety of commodity hardware.
3	Big Switch Switch Light	Switch Light OS is an SDN-centric NOS that Big Switch has developed to closely integrate with whitebox hardware and ensure that OpenFlow-like functions will operate on the current generation of switching silicon for the data center.
4	Open Network Linux	Open Network Linux (ONL) is a Linux distribution for “bare metal” switches, that is, network forwarding devices built from commodity components. ONL uses ONIE to install onto on-board flash memory.
5	Dent – Linux Foundation	DENT will utilize the Linux Kernel, Switchdev, and other Linux based projects as the basis for building a new standardized network operating system without abstractions or overhead
6	Coriant	Coriant makes the Coriant NOS, aimed at service providers and carriers who are interested in disaggregation.

Source: <https://packetpushers.net/virtual-toolbox/list-network-operating-systems/>

3.2 Types of Network Operating Systems

There are two (2) main types of Network Operating System (NOS). they are peer-to-peer network operating system and client/server network operating system.

1. **Peer-to-Peer Network Operating System:** In this type of NOS, files are stored on individual computers rather than on a central server. This means that the each of the connected computers work

together to keep the network running through sharing the contents in their hard drive.

Peer-to-Peer Model

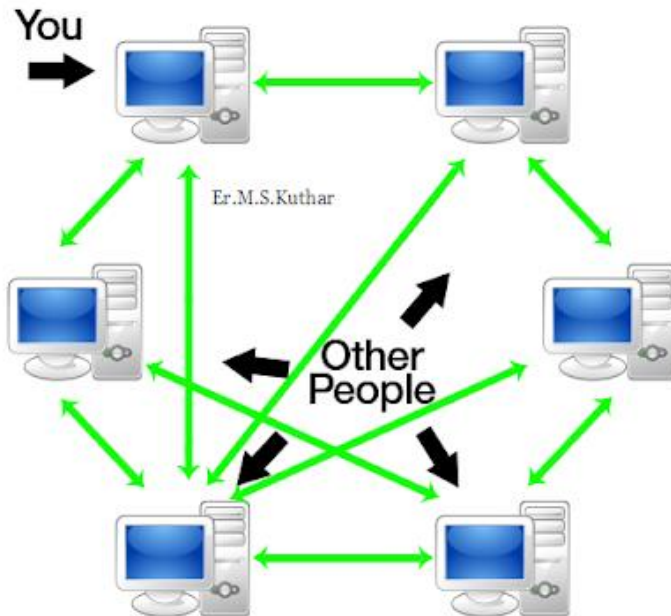


Fig 76: Source:<https://dcandcn.blogspot.com/2019/11/what-is-network-operating-system-nos.html>

Peer to peer architecture treats all computer equally with regards to their functionality. It is less expensive to set up and suitable for small or medium LAN.

Advantages of Peer-to-Peer Network

- i. Installation and setup is uncomplicated
- ii. It is less expensive to set up
- iii. It does not require any special software
- iv. Information sharing is fast and easy

v. Disadvantages of Peer-to-Peer Network

- vi. It does not have a centralized storage system
- vii. It lacks back up functionalities
- viii. It is not centrally managed
- ix. Individual computers may not perform optimally

2. **Client /Server Network Operating System:** In this type of NOS files are stored in a server rather than on individual computers. This means that all the functionalities are stored under one file server.

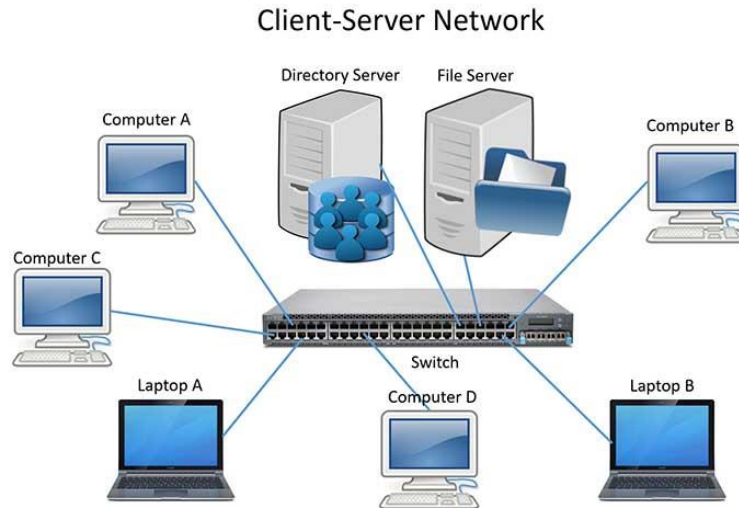


Fig 77: Source: <https://djomegni.com/portfolio/networking/>
Irrespective of the location, connected computers can still have access to the server. It is the most commonly used network operating system in schools, organizations, homes, businesses etc.

Advantages of Client/Server Network Operating System

- i. The network is centrally controlled
- ii. Its backs up facility performs optimally
- iii. Connected computers can access files concurrently

Disadvantages of Client/Server Network Operating System

- iv. It is not cost effective
- v. It requires specialized software to function effectively
- vii. Failure of the central server leads to failure of the entire system
- viii. System overload can occur when many computers wants to access the server at the same time

3.3 Features of Network Operating System

Features of NOS can be ascertained based on its ability to maintain the system ensure effective user administration and manage resources in the network. The features can be summarized as follows:

- i. Security features such as authentication login and access controls are provided by the system.
- ii. Multiple computers are allowed to connect and share resources
- iii. It provides back up for lost files on the web
- iv. It allows for the adding of new hardware into the system
- v. It provides support for routing
- vi. It provides name ad directory services
- vii. It provides support for printing and application sharing

4.0 SUMMARY

In this unit we discussed computer networks and network operating systems. We explained that **computer network** is defined as when two or more computers are connected with one another for the purpose of communicating data electronically. The computer network can be useful in the following areas:

1. It can be used to share information among all user in the network.
For example Network printers
2. It ensure easy communication from one computer to another
3. It eliminates the distance barrier in information sharing
4. It can be used for educational purposes
5. It ensure fast and easy exchange of data through the network

The following are some of the advantages of computer network

1. It increases speed: A network provides a fast means of sharing and transferring files
2. Security of information: It provides a secured environment for sharing information.
3. Ease of cost: Due to the prevalence of many popular versions of software, networkable software are now available at a significantly reduced cost.
4. It serves a medium of communication: Using a network assist people working far apart to share information from one end to another hence ensuing co-operation among them.

We explained that a topology of a network describes the way computer are connected to each other. It is a major design consideration for cost and reliability. There are two possible ways to connect the devices. They are: point to point connection and multipoint is also called a multi-drop connection. There are five (5) basic network topologies namely: Bus topology, star topology, mesh topology, Tree topology and Ring or circular topology.

We also explained that there are five (5) types of networks, they include: Local Area Network (LAN), Wide Area Network (WAN), Metropolitan Area Network (MAN), Wireless Networks and Internet. We described a network operating system (NOS) is a computer operating system that is intended to support computers connected to a LAN such as personal computers, workstations to enable them share and communicate with each other. There are two (2) main types of Network Operating System (NOS). they are peer-to-peer network operating system and client/server network operating system.

Features of NOS can be ascertained based on its ability to maintain the system ensure effective user administration and manage resources in the network. The features can be summarized as follows:

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- iv. It allows for the adding of new hardware into the system
- v. It provides support for routing
- vi. It provides name ad directory services
- vii. It provides support for printing and application sharing

5.0 CONCLUSION

Network is indispensable in everyday life. Its main aim is to exchange data and information such as texts, audio and video from one point to another. Hence advances in technology are making it possible for communication links to carry signals faster. Therefore, businesses, organizations and industries are keying into these advance to enhance their services.

Self – Assignment Exercise

List the advantages and disadvantages of ring topology

6.0 TUTOR-MARKED ASSIGNMENT

1. What is the rationale for using a network?
2. List the advantages and disadvantages of mesh topology
3. What is a network Operating system?
4. Using a diagram explain peer to peer network

7.0 REFERENCE/FURTHER READING

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<https://djomegni.com/portfolio/networking/>

UNIT 3 COMPUTER VIRUS, THEIR TYPES AND WAYS OF PREVENTING A VIRUS IN COMPUTER OPERATING SYSTEM

CONTENTS

- 1.0 Introduction
- 2.0 Intended Learning Outcomes (ILOs)
- 3.0 Main Content
 - 3.1 Overview of the concept of computer virus
 - 3.1.1 Ways in which a computer can get a virus
 - 3.1.2 Sign of a computer virus
 - 3.2 Types of computer virus
 - 3.3 Ways of preventing a virus in computer operating system
- 4.0 Summary
- 5.0 Conclusion
- 6.0 Tutor-Marked Assignment
- 7.0 Reference/Further Reading

1.0 INTRODUCTION

In unit 2 we explained that computer networks enable computers to communicate and share data, information resources and applications. As computer systems have become all-encompassing in their applications the need to protect the integrity of the computers has also grown. In this unit we will discuss meaning of virus, their types, how they threaten the operating system and ways to prevent them from destroying the operating system.

2.0 INTENDED LEARNING OUTCOMES (ILOS)

By the end of this unit, you will be able to:

- Understand the concept of virus
- Identify the different types of viruses
- Understand how to prevent a virus from attacking the operating system

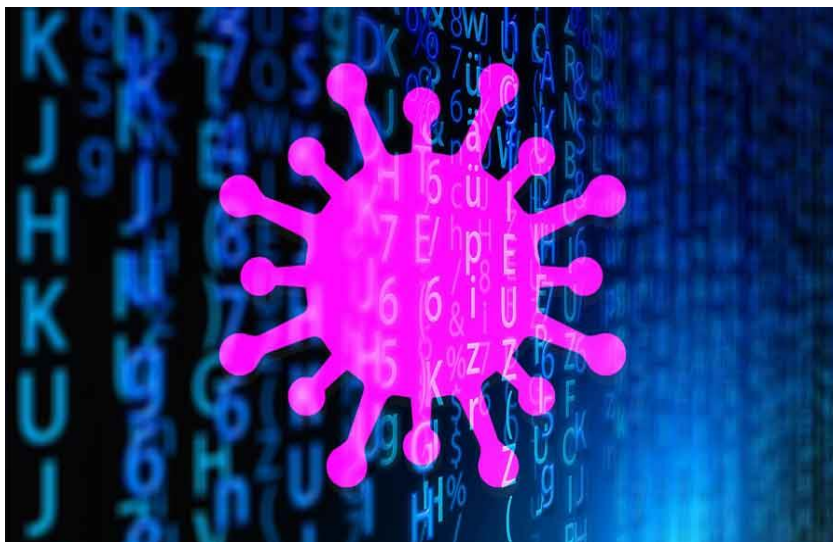
3.0 MAIN CONTENT

3.1 Overview of the Concept of Computer Virus

In an era of information explosion and information driven environment, individuals and businesses must learn how to manage and protect their information against attacks and risks which spread through electronic communication. Such risks come as virus. A virus according to Silberschatz et al (2016) is a fragment of code embedded in a legitimate

programme. The Economic Times (2021) describes it as a malicious software programme loaded onto a user's computer without the user's knowledge and performs malicious actions. It is a malicious code which spreads from one device to another. From the above definitions, it can be deduced that virus is a set of coded programmes which is meant to disrupt the functionalities in a computer system. It could also be seen that a computer system can have a virus without the users' knowledge. Not all computer viruses are harmful or destructive. Some of them are designed by their programmers to assist in identifying security loopholes in certain organizations or government agencies. Their aim is to improve system security.

The term virus was derived from the Latin which means "poison or toxic". The origin of the computer virus could be traced to Fred Cohen, an American who is the first to programme the first virus in 1983. Even though Fred is not a hacker but a Professor of computer security at the University of New Haven, he laid the foundation for the development of virus as we have it today.



Fig

78:

Source:<https://www.missioncriticalmagazine.com/articles/93186-biological-viruses-versus-computer-viruses>

When a virus attacks a computer system, the infected application (which is usually at the request of the user) moves the code it is carrying into the Central Processing unit (CPU) before any of the legitimate codes implements. At this instance, the virus broadcasts itself by infecting other files and application and inserting malicious codes in the computer. The virus can infect a programme while it is in use or files can be infected even when they are not running. Once the virus has taken hold of this computer, it starts executing its payload. A payload is term used to describe the malicious codes that implements the reason for creating the virus.

3.1.1 Ways A Computer Can Get a Virus

A computer can get virus in many different ways. Some of them include:

- i. When sharing music, photos, videos and files with other computers
- ii. When opening an email or a spam mail from an unknown sender
- iii. When downloading free games, media players, toolbars and other utilities
- iv. When downloading and installing some software.
- v. By clicking on suspicious sites
- vi. By clicking on some online adverts

3.1.2 Sign of A Computer Virus

There are signs a computer will be showing for the user to know that it has been infected by a virus. Some of such signs include:

- i. Frequent crashes of the computer
- ii. Unusual and frequent pop up of windows or applications
- iii. Unusual changes in password
- iv. Mass message being sent out from your account or email
- v. Unusual loss of data
- vi. Slow performance of the computer

3.2 Types of Computer Virus

There are literally thousands of viruses but they fall into several main categories. These categories are discussed below:

- i. **File virus:** This type of virus category infects a system by attaching itself to a file. It alters the start of a programme so that execution uses its code to start the programme. After it executes, it returns control to the programme so that its execution is not noticed. File virus are sometimes known as parasitic viruses as they leave no files behind and allows the programme to run normally.
- ii. **Boot virus:** A virus infects the boot section of the system. It executes every time the system is booted before an operating system is loaded. It also infects any bootable media. This type of virus is also known as memory viruses because they cannot be seen in the file system.
- iii. **Macro Virus:** Macro virus is a high-level language virus (Visual Basic) which is triggered when a programme capable of executing a macro application is turned on.

- iv. Source code virus: A source code virus identifies source codes and modifies it to include the virus and to assist in spreading the virus
- v. Polymorphic virus: A polymorphic virus tries to avoid detection by antivirus by changing each time it replicates itself. This change does not affect its functionality but rather changes its signature (a pattern that can be used in identifying a virus).
- vi. Encrypted virus: An encrypted virus adds decryption code with the encrypted virus in avoid to detection
- vii. Armored virus: An armored virus is coded in such a way that antivirus researchers are unable to comprehend it. It is also compressed to avoid detection. It hides in files and cannot be viewed in file names.

Wells (2010) identified other types of viruses to include

- i. **A worm:** This is the type of virus that makes a copy of itself, resulting in the consumption of system's resources. It slows the system down or actually halts tasks. Worm do not have to attach themselves to other files to execute.
- ii. **A Time Bomb:** This is the type of virus that does not cause its damage until certain date or until the system has been booted a certain number of times.
- iii. **A logic Bomb:** A logic bomb is a virus triggered by the appearance or disappearance of a specific data
- iv. **A Trojan horse:** This is the type of virus that does something different from what it is expected to do. It may look like it is doing one thing while in actuality it is doing something quite opposite

3.3 Ways of Preventing a Virus in Computer Operating System

A virus can cause damage to a computer's data. To protect a computer against virus attacks, there is need to put some necessary measures into consideration

- i. There is need to use an antivirus software: This software should always run on the computer and should be updated regularly,
- ii. Do not access files copied form USB drives and other media or downloaded from the internet without scanning them first.
- iii. Evaluate free software and file sharing applications carefully before downloading
- iv. Use spam and malware to scan to filter email inboxes
- v. Deal cautiously with internet sources
- vi. Avoid clicking on pop up adverts
- vii. When redirected to another website, leave the site immediately
- viii. Increase the browser security settings

4.0 SUMMARY

In this unit we discussed virus, their types and ways of preventing a virus from infecting the operating system. A virus is defined as a set of coded programmes which is meant to disrupt the functionalities in a computer system. The term virus was derived from the Latin which means "poison or toxic". The origin of the computer virus could be traced to Fred Cohen, an American who is the first to programme the first virus in 1983. . The virus can infect a programme or will while it is in use or files can be infected even when they are not running. Once the virus has taken hold of this computer, it starts executing its payload. A payload is term used to describe the malicious codes that implements the reason for creating the virus.

A computer can get virus in many different ways. Some of them include:

- i. When sharing music, photos, videos and files with other computers
- ii. When opening an email or a spam mail from an unknown sender
- iii. When downloading free games, media players, toolbars and other utilities
- iv. When downloading and installing some software.
- v. By clicking on suspicious sites
- vi. By clicking on some online adverts
- vii. There are literally thousands of viruses but they fall into several main categories. These categories are discussed below: file virus, Boot virus, Macro virus, Source code virus, Polymorphic virus, Encrypted virus and Armored virus.

A virus can cause damage to a computer's data. To protect a computer against virus attacks, there is need to put some necessary measures into consideration

- i. There is need to use an antivirus software: This software should always run on the computer and should be updated regularly,
- ii. Do not access files copied form USB drives and other media or downloaded from the internet without scanning them first.
- iii. Evaluate free software and file sharing applications carefully before downloading
- iv. Use spam and malware to scan to filter email inboxes
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- viii. Increase the browser security settings

5.0 CONCLUSION

For more than three decades now, computer viruses have been part of human life. An unprotected computer exposes the computer to danger. Therefore, it is pertinent to protect your computer by installing an antivirus and regularly keep it up to date it in order to forestall all forms of malicious malware.

Self – Assignment Exercise

In what ways can virus be prevented from running in a system?

6.0 TUTOR-MARKED ASSIGNMENT

1. What is a virus?
2. Describe in details ways in which a virus can enter into a computer
3. Explain seven types of virus discussed in this manual

7.0 REFERENCE/FURTHER READING

Silberschatz, A, Galvin, P.B., Gagne, G. (2014). *Operating systems concepts*. New Delhi: Wiley & sons

The Economic Times, (2021). *Definition of Computer Virus*.
<https://economictimes.indiatimes.com/definition/computer-virus> sourced on 2 August, 2021.

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UNIT 4 OVERVIEW OF THE APPLICATION OF MINI AND MICRO COMPUTERS IN LIBRARY AND INFORMATION PROFESSION

CONTENTS

- 1.0 Introduction
- 2.0 Intended learning outcomes (ILOs)
- 3.0 Main Content
 - 3.1 Overview of mini and micro computers
 - 3.2 Difference between mini and micro computers
 - 3.3 Application of mini and micro computers in Library and information profession
- 4.0 Summary
- 5.0 Conclusion
- 6.0 Tutor-Marked Assignment
- 7.0 Reference/Further Reading

1.0 INTRODUCTION

The advent of computer has tremendously improved service delivery of businesses and organizations. Library and information profession is not left out in this regard as many of its services have been transformed with the introduction computers. Therefore in this unit, our focus will be on mini and microcomputers and its application to library and information profession.

2.0 INTENDED LEARNING OUTCOMES (ILOs)

By the end of this unit, you will be able to:

- Understand the meaning of mini and micro computers
- Identify the difference between mini and micro computers
- Understand the application of mini and micro computers in library and information profession

3.0 MAIN CONTENT

3.1 Overview of Mini and Micro Computers

The development of computer started with the large computers. It has evolved over the years to what we have today. Minicomputers are the type of computers that have the functionalities of a large computer but it is smaller in size than the large computer and larger than a micro-computer. It was introduced in mid 1960s and they are used as servers in operating businesses and applications.



Fig 79: A Mini Computer.

Source: <https://www.indiamart.com/proddetail/mini-computer-11778546612.html>

Their storage capacity, high processing power, low maintenance cost has endeared the use of minicomputer. It can support multi users at the same time. The users can access minicomputers through PCs or terminals. They are used for real time applications in organizations research institutes etc. examples of minicomputers include: Apple ipad, Samsung tablet, ipod, Notebook etc.

Advantages of Minicomputers

- i. They are small and handy
- ii. They are fast when compared to their size
- iii. They are easy to use
- iv. They are reliable
- v. They can perform efficiently under normal environment without requiring any charge
- vi. They are durable

vii. Disadvantages of Minicomputers

- viii. They have smaller keyboards
- ix. They do not have USB/CD/DVD drives and ports
- x. They can be too small to perform some activities

Microcomputer also known as Personal Computers (PCs) on the other hand is a computer with Central processing Unit (CPU) as the microprocessor. According to Thakur (2021) a micro computer is a computer in which the CPU is contained in a single chip (Microprocessor) input/output devices and storage (memory) unit. The components of a microcomputer's CPU include Random Access Memory (RAM), Read-only Memory (ROM), Input/output (I/O) ports, a motherboard and wires that are interconnected. These components are

necessary for the microcomputer to function properly. Examples of microcomputers include: Desktop computers, Laptop computers.



Fig80: Micro Computer

Source:<https://politicaleconomyzone.wordpress.com/2017/03/02/classification-of-micro-computers/>

The origin of microcomputers dates back to the 1970s with the development of Intel 4004 and later 8008 microprocessors. Réalisation d'Études Électroniques (R2E) developed the first microcomputer which was based on Intel 8008 in 1973. In 1974 Micro Instrumentation Telemetry System (MITS) designed the Altair 8800 which was referred to as the first commercial microcomputer. By 1980s, with the constant developments in microprocessors, the use of microcomputers became widespread. By the 1990s, microcomputers were used in personal computing, workstation and the academia.

Uses of Microcomputers

- i. It is used for educational purposes
- ii. It is used for entertainment such as games, music
- iii. It is used for applications such as word processing, spreadsheet, graphic designs
- iv. It is used for business purposes such as accounting, book keeping etc.
- v. It is used record keeping

3.2 Difference Between Mini and Micro Computers

There are quite a number of differences between minicomputers and microcomputers.

The table below describes this discrepancy in details.

S/N	Minicomputers	Microcomputers
1	Minicomputers were developed in the 1960s	Microcomputers were developed in 1970s
2	Minicomputers can be quite large.	Microcomputers are generally considered the small in size
3	Minicomputers were used for performing financial and administrative tasks, such as word processing and accounting.	Microcomputers are used for word processing, managing databases or spreadsheets, graphics and general office applications.
4	They are used in organizations to control manufacturing process	They are used in education and entertainment
5	It has double processing optimization.	It made up of single processing optimization.
6	It uses multiple processor	It uses a single microprocessor
7	The capacity of the storage is in Gigabyte (GB).	The Storage capacity is in Terabyte (TB).
8	It is more expensive and not easy to use as compared to microcomputers.	It is less expensive and easy to use as compared to minicomputer.
9	It uses magnetic disks or tapes for secondary storage.	It uses tapes and disks as storage devices.
10	Minicomputers are faster in terms of speed and performance	Microcomputers are very slower in terms of speed and performance

3.3 Application of Mini and Micro Computers in Library and Information Profession

Computer and its associated technologies have tremendously changed the function of library and information profession. Libraries are using these technologies to increase its efficiency and effectiveness of their daily work and services. The influence of computer and its associated technologies could be seen in the following areas of library work and services:

1. **Acquisition:** The acquisition section of the library is responsible for selection, ordering, bill payments, processing and accessioning all information resources in the library. The traditional system of acquiring books in the library is time consuming, but with the advent of computer and information technologies the process of acquisition can be carried out without any delay. Through the use of E-mail the library can send list of orders directly to publisher, vendors or book seller without meeting them face to face. This reduces the barrier of distance and delay in responses from vendors. Also libraries can subscribe to online books and journals available in databases. At just a click of the computer, libraries can have access to millions of books and journals rather than depend on prints and wait for months before it is delivered to them
2. **Cataloguing and Classification:** The cataloguing and classification section traditionally is responsible for preparing entries such as title, author, series editor and call number etc. to information resources in order to satisfy the demands of the users. The introduction of computer and the associated technologies has significantly transformed cataloguing process. Entries are now keyed into a digital database designed in the Integrated Library software (ILS) in order create an easy access for users. With the Online Public Access Catalogue (OPAC) users can stay in the comfort of their homes and access the library collection. Also with the entries in classification website, Librarians can access all Library of Congress Classification schedules and Library of congress Subject heading and Name Headings on the web. This reduces the amount of time spent on cataloguing a single information resource.
3. **Circulation:** The circulation section is responsible for overseeing the public relations of the library. They register users, charge and discharge books, provide reference services, keep library statistics, provide inter-library cooperation, provide Selective Dissemination of Information (SDI) service, provide Current Awareness Services (CAS), etc. in the traditional library operation, some of these services requires that users stand and wait in long queues before the services can be provided. Computers and its associated technologies has also altered the way services are provided in this section. Users can register online through the library website; overdue charges and statistics are also calculated and generated automatically by the ILS. Currently, with the aid of RFID and bar codes library systems are gearing towards issuing books like the Automated Teller Machines (ATM). The RFID is also assisting the library in checking for theft, book tracing and stock verification.

4. **Online databases:** Online databases are a collection of books and scholarly journals from various publishers in an electronic format. Access to some of these databases are for free and others for a fee with annual subscription. As soon as the library subscribes to these databases, it creates access to thousands of books and scholarly articles for researchers in their field of specialization.
5. **CD-ROM databases:** These are databases which are stored offline on CD-ROMs. They can be accessed by users within the library and can also be printed when required. The storage capacity of CD-ROM is approximately 650MB. It less expensive to acquire and requires less space to store. The development of CD-ROM technology has alleviated difficulty encountered by the library in the storage of newspapers, magazines and other periodicals as many of them are mostly available on CD-ROM.

4.0 SUMMARY

In this unit, we discussed overview of the application of mini and micro computers in library and information profession. We defined minicomputers as the type of computers that have the functionalities of a large computer but it is smaller in size than the large computer and larger than a microcomputer. It was introduced in mid 1960s and they are used as servers in operating businesses and applications. They are used for real time applications in organizations research institutes etc. examples of minicomputers include: Apple ipad, Samsung tablet, ipod, Notebook etc.

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- ii. It is used for entertainment such as games, music
- iii. It is used for applications such as word processing, spreadsheet, graphic designs
- iv. It is used for business purposes such as accounting, book keeping etc.
- v. It is used record keeping

There are quite a number of differences between minicomputers and microcomputers that were identified. Libraries are using these technologies to increase its efficiency and effectiveness of their daily work and services in the areas of acquisition, cataloguing and classification, circulation, online databases, CD-ROM databases etc.

5.0 CONCLUSION

Generally, computers have become a vital component for cultural and socio-economic development of the human society. Its development has evolved over the years from large to smaller computers. It is expected that this trend and its impact on every sphere of life will continue in the coming years. Computer and its associated technologies have impacted positively in the library and information profession with special impact on acquisition, cataloguing and classification, processing, storage and dissemination of information.

Self – Assignment Exercise

List four (4) components of microcomputers

6.0 TUTOR-MARKED ASSIGNMENT

1. What are microprocessors?

2. Give a brief description of the origin of mini and microcomputers
3. List the advantages and disadvantages of minicomputers
4. Explain four (4) areas in which computer and its associated technologies has impacted on library and information profession
5. Describe the term microcomputers

7.0 REFERENCE/FURTHER READING

Thakur, D. (2021). What is microcomputer? Definition <https://ecomputernotes.com/fundamental/introduction-to-computer/microcomputer>, sourced on 4 August 2021

<https://www.indiamart.com/proddetail/mini-computer-11778546612.html>

<https://politicaleconomyzone.wordpress.com/2017/03/02/classification-of-micro-computers/>