THE IMPERATIVES OF OPERATING SYSTEM IN EVERY COMPUTER SYSTEM

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Abstract

This paper discusses the necessity of operating system in our computer systems. It explains how operating system is the major tool that enables every computer user interacts with his computer hardware without struggles. It explains abstraction and arbitration as the two major services that operating system renders. It goes further to look at the different views of computer users about the functions of operating system. The study adopted descriptive survey research method. A total number of 86 respondents were used. A structured questionnaire was used for data gathering. The reliability coefficient of the instrument was 0.70 using Cronbach Alpha Coefficient method while two lecturers carried out face validation on the instrument. Two research questions and two hypotheses guided the study. Mean and Standard deviation were used to answer the research questions while t-test statistics were used to test the null hypothesis. It was found out that operating system is essential in every computer system. It was discovered that operating system performs some vital roles starting from aiding booting process to the use of application software and the peripherals of the computer system. The study recommends that every computer user should install an anti-virus on his/her computer as this will help prevent the operating system files from being eaten up by viruses or worms and that system tools such as disk defragmenter, scandisk, and disk cleanup should be used on a routine basis to help fix some hard disk errors that may arise. This will always help to keep the operating system in good shape.

Keywords: Operating system, imperatives, computer component, function, Abstraction & arbitration, computer users

Introduction

A computer is a programmable device that can automatically perform a sequence of calculations or other operations on data once programmed for the task. It can store, retrieve, and process data according to internal instructions. It is an electronic device that processes data, converting it into information that is useful to people. A computer may be digital, analog, or hybrid, although most in operation today are digital. Digital computers express variables as numbers, usually in the binary system. They are used for general purposes, whereas analog computers are built for specific tasks. Computer come in diverse sizes, from the tiny computers built into household appliances, to the astounding supercomputers that have helped scientists in doing research. Norton (2005) stated that a complete computer system consists of four parts namely: - Hardware, Software, Data and the user. Amuno (2018) opined that computer functions on three major system components; hardware, software, and humanware (User). Hardware and software exist together to make up the actual computer. The humanware component adds in the life factor in order to bring the whole computer into a functional existence. Each of these components is necessary in order to enable meaningful productivity. If installed separately, each may be useful to an extent but incapable of achieving complete computing potential. Hardware and software need the human factor in order to make input (data) and connectivity possible. Any computer regardless of its type is controlled by programmed instructions which give the machine a purpose and tell it what to do.

A computer would not be able to function correctly without an operating system. An operating system is a software program that empowers the computer hardware to communicate and operate with the computer software. Bhowmick (2014) stated that an operating system is a set of program files which controls the resources of the computer system and allows the communication of hardware components of a computer to the software components of the computer system. Operating system is an integrated system of programs which supervises the operations of the CPU, controls the input/output and storage functions of the computer system and provides various support services as the computer executes the application programs of users (Umar, 2016). It is a system software that manages computer hardware and software resources and provides common services for computer programs. Operating systems provides access to computer services which is possible only via working of both the hardware components and the software components. The function of the operating is to control the activities of the computer system. It serves as the traffic warden, directing and managing computer events (Athey & Zwud, 1996 and Wikipedia, 2018). To do this, the operating system has a set of program called a

supervisor, an executive, or a monitor. The supervisor handles the overall management of the many jobs and tasks that are being conducted by the computer system. The supervisor selects the application program to be run next, based on predefined rules. The resource management function is concerned with making the computer resources such as CPU, primary memory, input/output devices and support available in an efficient way.

The operating system provides an interface between an application program and the computer hardware, so that an application program can interact with the hardware only by obeying rules and procedures programmed into the operating system (Wikipedia, 2018). The operating system is also a set of services which simplify development and execution of application programs. Executing an application program involves the creation of a process by the operating system kernel which assigns memory space and other resources, establishes a priority for the process in multi-tasking systems, and loads program binary code into memory, and initiates execution of the application program which then interacts with the user and with hardware devices.

Supplementing the operating system are the language translators. These programs translate the high level languages like BASIC JAVA, C++ into machine languages. Operating system is basically an interface between user and machine which works as translator it translate user query into machine language (binary language) and processes and then sends back to OS and it converts processed query into user readable form. So to interact with machine to give command to machine you need an OS which could be Windows, Linux, Macintosh or even DOS.

Conclusively, operating systems are the foundation of your computer and almost every electronic device. The OS helps to boot up the computer and makes sure everything is operational. The Operating System (OS) is not only one of the most important systems software on a computer, but is also the most frequently used. It is the software that runs in the background and brings the separate physical parts of the computer together in order to provide the seamless stream of activity that a user experiences. Looking at the crucial roles of operating system, we felt it is quite needful to investigate the imperatives of operating system in every computer system.

LITERATURE REVIEW

Functions of operating system

Many different operating systems exist, designed for all types of computers. Regardless of the types of computer, operating systems provides similar functions. The operating system handles many of these functions automatically without requiring any instruction from the user. Magister (2014) and Laverty (2015) agreed that most important functions of an

operating system are the management of the entire computer's internal and external hardware. The operating system controls all connected devices, telling them how to operate and interact. The results of said operations and interactions are the basic performance of the computer. Hussain (2017) stated that each hardware device speaks a different language, but the operating system can talk to them through the specific translational software called device drivers. Every hardware component has different drivers for Operating systems. These drivers make the communication successful between the other software and the hardware. Some examples of the hardware that the operating system controls include the hard disk, printer, optical drives, video cards and external port controllers, such as USB and Firewire etc.

Another function of operating system is interface between the user and the hardware. An OS provides an interface between user and machine (Hussain, 2017) and Beal, 2017). That is a user interface controls you enter data and instructions and how information is displayed on the screen. This interface can be a graphical user interface (GUI) in which users click onscreen elements to interact with the OS or a command-line interface (CLI) in which users type commands at the command-line interface (CLI) to tell the OS to do things. Operating systems often use a combination of these interfaces to define how users interact with a computer.

Moreover, Shelly, Cashman & Vertat (2008) opined that operating system manages programs. Some operating systems support a single user and only one running program at a time. Others support thousands of users running multiple programs. How an operating system handles programs directly affects your productivity. Early systems are single user/single tasking but most today's operating systems are multitasking. PDAs, smart phones and other small computing devices use a single user/ single tasking operating systems. A single user/ multitasking operating system allows a single user to work two or more programs that reside in memory at the same time and users today typically run multiple programs concurrently. It is common to have an e-mail program and web browser open at all times, while working with application programs such as word processing or spreadsheet processing. When a computer is running multiple programs concurrently, one program is in the foreground and the others are in the background. The one in the foreground is the active program, that is, the one you currently are using while the other programs running but not in use are in the background. The foreground program typically displays on the desktop and the background programs are partially or completely hidden behind the foreground program. The user can easily switch between foreground and background programs.

In addition to application programs an operating system manages other processes (Shelly, Cashman & Vertat, 2008). These processes include utilities or routines that provide support to other programs or hardware. Some operating systems use preemptive multitasking to prevent any one process from monopolizing the computer's resources. With preemptive multitasking, the operating system interrupts a program that is executing and passes control to another program waiting to execute. An advantage of preemptive multitasking is the operating system regains control if one program stops operating properly.

However, Curt & Dave (2000) and Shelly, Cashman & Vertat (2008) stated that multiuser operating system enables many different users to take advantage of the computer's resources simultaneously. The operating system must make sure that the requirements of the various users are balanced, and that each of the programs they are using has sufficient and separate resources so that a problem with one user doesn't affect the entire community of users. Examples are networks, servers, mainframes and supercomputer that allow hundreds of users to connect at the same time. A multiprocessing operating system supports two or more processors running programs at the same time. Multiprocessing involves the coordinated processing of programs by more than one processor. It increases a computer's processing speed. A computer with separate processors also can serve as a fault-tolerant computer. A fault tolerant continues to operate when one of its components fails, ensuring that no data is lost. These computers have duplicate components such as processors, memory and disk drives. If any one of these components fails, the computer switches to the duplicate components and continues to operate. Examples are machines that must be operational always like airline reservation systems, communications networks, automated teller machines etc.

Again, Laverty (2015) stated that operating system manages the network communication. The operating system also facilitates network communication by enabling connected network devices to communicate with the computer and with any programs that require them. Network cards, such as Ethernet ports and wireless LAN cards, have the tools to connect with networks but need the operating system to direct their communication correctly so information can be exchanged. The operating system also interprets the information that comes in and determines which installed program can best display it for you. Shelly, Cashman & Vertat (2008) said some operating systems include a web browser and an email program, enabling you to begin using the web and communicate with others as soon as you set up the internet connection. Some also include utilities to protect computers, unauthorized instructions and unwanted software such as viruses and spyware.

Moreover, Silberschatz, Galvin & Gagne (2009) and Volker (2018) stated that memory management is one of the function of operating system. The authors went ahead to state that to execute a program, it must be mapped to absolute addresses & loaded into memory. As the program executes, it accesses instructions & data from memory by generating these absolute addresses. In multiprogramming environment, multiple programs are maintained in the memory simultaneously. The OS is responsible for the following memory management functions:

- Keep track of which segment of memory is in use & by whom.
- Deciding which processes are to be loaded into memory when space becomes available. In multiprogramming environment it decides which process gets the available memory, when it gets it, where does it get it, & how much.
- Allocation or de-allocation the contents of memory when the process request for it otherwise reclaim the memory when the process does not require it or has been terminated (Volker, 2018)

Operating systems provide user with the capability of managing files, searching for file, viewing images, securing a computer from unauthorized access, uninstalling programs, scanning disks, defragmenting disks and setting up screen saver (Shelly, Cashman, &Vertmat, 2008 and Silberschatz, Galvin & Gagne, 2009). The operating system implements the abstract concept of a file by managing mass-storage media, such as tapes and disks, and the devices that control them. Files are normally organized into directories to make them easier to use. And when multiple users have access to files, it may be desirable to control by whom and in what ways (for example, read, write, append) files may be accessed. Dang, Vu & Vu (2005) and Silberschatz, Galvin & Gagne (2009) stated that the operating system is responsible for the following activities in connection with file management:

- Creating and deleting files
- Creating and deleting directories to organize files
- Supporting primitives for manipulating files and directories
- Mapping files onto secondary storage
- Backing up files on stable (nonvolatile) storage media

Purpose of the Study

The purpose of this study was to ascertain the imperatives of operating system in every computer System. Specifically, the study sought to find out:-

1. the functions of operating system in a computer system

2. whether every computer system should have an operating system

Research Questions

The following research questions guided the study:

1. What are the functions of operating system in a computer system?
2. Should every computer system have an operating system?

Research Hypotheses

The following null hypotheses were tested at 0.05 level of significance:

1. There is no significant difference between the mean responses of male and female lecturers on the functions of operating system in a computer system.
2. There is no significant difference between the mean responses of male and female lecturers on the functions of operating system in a computer system.

Research Methods

The study adopted a descriptive survey research design. The study was carried out in south east Nigeria. The study covered five federal universities in south east. These federal universities are Federal University, Ndufu-Alike, Ebonyi State, Federal University of Technology, Owerri, Nnamdi Azikiwe University, Awka, Michael Okpara University of Agriculture, Umudike in Abia State and University of Nigeria, Nsukka. Each of the university has Computer as a programme and the lecturers all have and work with computers. The population for this study was 89 respondents comprising of thirty six (36) male lectures and fifty (53) female lecturers. The entire population was studied. Therefore, no sampling was done.

The instrument for data collection was a 4-point scale structured questionnaire. The instrument was subjected to face validation by three lecturers: one from the Department of Computer Education and two from Computer Science Department of University of Nigeria, Nsukka. Each lecturer was served with a copy of the instrument and was requested to read through each item for the purpose of identifying ambiguous statement and offer suggestions for improving the instrument. The instrument was also subjected to reliability test, using Cronbach alpha method to determine the internal consistency which yielded a coefficient of 0.70. The questionnaire was administered by the researchers with the aid of three research assistants.

Data collected for the study were analyzed using the mean to answer the research question. Based on the four point rating scale of the questionnaire, a mean of 2.5 was adopted as the acceptance or agreement level for the items. Consequently, any mean below 2.5 was taken as rejection. The structured questionnaire items 1-15 had a 4-point rating scale of Strongly Agree (SA), Agreed (A), Disagree (D) and Strongly Disagree (SD) representing 4, 3, 2 and

1 respectively. Similarly, t-test was used to test the null hypotheses at 0.05 level of significance using SPSS software.

Results:

The result of the study is presented below:-

Research Question 1: What are the functions of operating system in a computer system?

Ho$_1$: **There is no significant difference between the mean responses of male and female**

Lecturers on the functions of operating system in a computer system

Table 1: Mean rating and T-test analysis of responses on the functions of operating system in a computer system

S /No	Item Descriptions	Male Lecturers N$_1$=36		Female Lecturers N$_2$ = 50		$\overline{x}_G$	SD$_G$	Rmk for RQ$_1$	t-cal	Sig 2 tailed	Rmk for HO$_1$
		$\overline{x}_1$	SD$_1$	$\overline{x}_2$	SD$_2$						
1	Operating system provides recovery of the system when the system gets damaged by bugs	3.75	0.55	3.70	0.46	3.73	0.51	Accepted	0.48	0.63	NS
2	Operating system provides users with capability of managing files, searching for files, viewing images, securing a computer from unauthorized access, uninstalling programs scanning disks, defragmenting disks, diagnosing problem, backing up of files and setting screen saver.	3.61	0.49	3.74	0.45	3.68	0.47	Accepted	-1.24	0.22	NS
3	It provides a stable, consistent way for applications to deal with the hardware without having to know all the details of the hardware.	3.56	0.50	3.66	0.48	3.61	0.49	Accepted	-0.99	0.32	NS
4	Operating System also breaks the large program into the smaller programs those called threads and execute those threads one by one	3.83	0.38	3.77	0.42	3.79	0.40	Accepted	0.68	0.50	NS
5	Operating system provides the memory to the process; also deallocate the memory from the process and defines that if a process gets completed then it will deallocate the memory from the processes.	3.61	0.49	3.49	0.51	3.55	0.50	Accepted	1.12	0.27	NS
6	**Network Operating System organizes and coordinate show multiple users access and share resources on the network**	3.75	0.44	3.77	0.42	3.76	0.43	Accepted	-0.25	0.80	NS
7	Operating System provides the Interface between the user and the hardware e.g. command line, graphical user interface (GUI)	3.67	0.63	3.45	0.70	3.56	0.67	Accepted	1.48	0.14	NS

8	Operating systems can make the computer's RAM seem larger than it really is. This trick is accomplished by means of virtual memory, a method of using the computer's hard disk as an extension of RAM.	3.56	0.50	3.59	0.50	3.58	0.50	Accepted	-0.27	0.79	NS
9	Operating system is *handles input and output,* as well as enabling communication with input and output devices. Most operating systems come with drivers for popular input and output devices	3.67	0.48	3.62	0.49	3.65	0.49	Accepted	0.42	0.68	NS
10	The operating system gives each running program its own portion of memory and attempt to keep the programs from interfering with each other's use of memory.	3.83	0.38	3.72	0.50	3.78	0.44	Accepted	1.19	0.24	NS
11	Operating system is capable of supporting and using more than one computer processor. Most modern computers support some form of multiprocessing	3.67	0.48	3.76	0.48	3.72	0.48	Accepted	-0.85	040	NS
12	Operating system allows multiple software processes to run at the same time	3.67	0.59	3.70	0.46	3.69	0.53	Accepted	-0.28	0.78	NS
13	A multi-user operating system allows for multiple users to use the same computer at different times	3.83	0.38	3.85	0.36	3.84	0.34	Accepted	-0.20	0.84	NS
14	Operating system handles "interrupts" generated by the I/O controllers	3.58	0.50	3.72	0.46	3.65	0.48	Accepted	-1.31	0.20	NS
15	Operating system helps in the booting of the computer system	3.78	0.42	3.77	0.42	3.78	0.42	Accepted	0.05	0.96	NS

Note : RQ= Research Question, HO$_1$ = Null Hypothesis 1, HO$_2$ = Null Hypothesis 2, NS = Not Significant, T-tab = 1.99, $\bar{x}_1$= mean of Male lecturers, $\bar{x}_2$ = Mean of Female lecturers, $\bar{x}_G$ = Grand Mean, SD$_G$ = Grand Standard Deviation, SD$_1$ = Standard Deviation of Male Lecturers, SD$_2$= Standard Deviation of Female Lecturers, N$_1$= Number of Male Lecturers and N2 = Number of Female Lecturers

The data presented in table 1 revealed the analysis on the functions of operating system in computer system was made. The data showed that all the items have the grand mean rating between 3.55 and 3.79 which were above the cutoff point 2.50, were accepted. The respondents accepted that all are the functions of operating system in a computer system

This was further confirmed by the test of hypothesis, presented on the same table. The t-test analysis revealed that there is no significant difference between the opinion of the male and female respondents on the 15 items isolated for the study. The items recorded t-calculated values less than tabulated value of 1.99 at 0.05 levels of significance and 84 degree of freedom on the respective items. It implied that there was no significant difference between the mean scores of male and female respondents on the functions of operating system in a computer system. The null hypothesis (H$_{01}$) for each independent sample in each item was therefore, upheld.

Research Question 2: Should every computer system have an operating system?

Ho$_2$: **There is no significant difference between the mean responses of male and female**

Lecturers on whether every computer system should have an operating system.

Table 2: Mean rating and T-test analysis of responses whether every computer system should have an operating system.

S/No	Item Descriptions	Male Lecturers N$_1$=36		Female Lecturers N$_2$ = 50		$\bar{x}_G$	SD$_G$	Remark for RQ$_2$	t-cal	Sig 2 tailed	Remark for HO$_2$
		$\bar{x}_1$	SD$_1$	$\bar{x}_2$	SD$_2$						
1	Operating system manages all of the software and hardware on the computer. Most of the time, there are many different computer programs running at the same time, and they all need to access your computer's central processing unit (CPU), memory, and storage.	3.61	0.49	3.55	0.50	3.58	0.50	Accepted	0.59	0.56	NS
2	Without an operating system using and enforcing a standard, systematic approach to running the computer, you are put in the position of writing code (or programs) that must tell the computer exactly what to do.	3.75	0.44	3.72	0.46	3.74	0.45	Accepted	0.34	0.73	NS
3	If you don't have an operating system, you're stuck doing one and only one process at a time.	3.67	0.63	3.53	0.64	3.60	0.64	Accepted	1.01	0.32	NS
4	Without an operating system, a computer cannot be of any important use since the computer's hardware would not be able to communicate with the software	3.56	0.50	3.47	0.50	3.52	0.50	Accepted	0.77	0.44	NS
5	It is not hard to manage hardware manually, not time consuming process as well as not hard to debug manually. So operating system does not control hardware effectively.	1.44	0.50	1.32	0.47	1.38	0.49	Rejected	1.18	0.24	NS
6	Operating system allows your input to be converted into commands that the computer processor can use and at times also provide the means for the product of the computation to be outputted via screen, port like a cable to a printer etc	3.67	0.48	3.59	0.50	3.63	0.49	Accepted	1.18	0.24	NS
7	An operating system does not play vital role in security. It does not prevent unauthorized users from accessing the computer system.	1.50	0.51	1.49	0.51	0.50	0.51	Rejected	0.09	0.93	NS

Note : RQ= Research Question, HO$_1$ = Null Hypothesis 1, HO$_2$ = Null Hypothesis 2, NS = Not Significant, T-tab = 1.99, $\bar{x}_1$= mean of Male lecturers, $\bar{x}_2$ = Mean of Female lecturers, $\bar{x}_G$ = Grand Mean, SD$_G$ = Grand Standard Deviation, SD$_1$ = Standard Deviation of Male Lecturers, SD$_2$= Standard Deviation of Female Lecturers, N$_1$= Number of Male Lecturers and N2 = Number of Female Lecturers

The data presented in table 1 revealed the analysis on whether every computer system should have an operating system was made. The data showed that the items 1, 2, 3, 4,and 6 have the grand mean rating between 3.52 and 3.74 which were above the cutoff point 2.50,

were accepted. The opinions of the respondents indicated that every computer system should have an operating system. The respondents rejected the items 5 and 7. The respondents rejected the opinion that It is not hard to manage hardware manually, not time consuming process as well as not hard to debug manually and that operating system does not play vital role in security. It does not prevent unauthorized users from accessing the computer system.

This was further confirmed by the test of hypothesis, presented on the same table. The t-test analysis revealed that there is no significant difference between the opinion of the male and female respondents on the 7 items isolated for the study. The items recorded t-calculated values less than tabulated value of 1.99 at 0.05 levels of significance and 84 degree of freedom on the respective items. It implied that there was no significant difference between the mean scores of male and female respondents on whether every computer system should have an operating system. The null hypothesis (H_{01}) for each independent sample in each item was therefore, upheld.

Major Findings

In view of the data analyzed and hypotheses tested, the following findings were recorded.

1. It was found out that the operating system is so imperative to computer system. All these functions among others are performed by operating systems. They are:- provides the Interface between the user and the hardware, breaks the large program into the smaller programs those called threads and execute those threads one by one, manage the computer's resources, such as the central processing unit, memory, disk drives, printers etc execute and provide services for applications software.

2. Equally, it was found out that all computer system should have operating system for the following reasons among others are: Operating system manages all of the software and hardware on the computer. Most of the time, there are many different computer programs running at the same time, and they all need to access your computer's central processing unit (CPU), memory, and storage, Without an operating system, a computer cannot be of any important use since the computer's hardware would not be able to communicate with the software and Operating system allows your input to be converted into commands that the computer processor can use and at times also provide the means for the product of the computation to be outputted via screen, port like a cable to a printer etc

3. There is no significant difference between the mean responses of male and female lecturers on the functions of operating system in a computer system

4. There is no significant difference between the mean responses of male and female lecturers on whether every computer system should have an operating system

Conclusion

The objective of this study was to ascertain the imperatives of operating system in a computer system. As earlier stated operating system perform basic tasks such as recognizing input from the keyboard, sending output to the display screen, keeping track of files & directories on the disk and controlling peripheral devices such as disk drives & printer. It also ensures that different programs and users running at the same time do not interfere with each other. The OS is also responsible for security, ensuring that unauthorized users do not access the system. Hussain (2017) said that operating system provides a consistent environment for other software to execute commands. To buttress this, Operating system acts as the center through which the system hardware, other softwares, and the user communicate.

The study adopted two research questions and two research hypotheses as search lights for the imperatives of operating system to computer system. Mean and standard deviation were used to answer the research questions and T-test statistic was used for hypotheses testing using SPSS software.. Thereafter, conclusions were drawn from the results. Owning to the conclusions and findings, relevant recommendations were made for the study.

Recommendations

Based on the findings of this study, the following recommendations are made. They are:-

1. Every computer user should install an anti-virus on his/her computer as this will help prevent the operating system files from being eaten up by viruses or worms.

2. System tools such as disk defragmenter, scandisk, and disk cleanup should be used on a routine (day-to-day) to fix some hard disk errors. This will help keep the operating system in good shape.

3. Before installing an operating system, users should make sure that their computers are compatible with the operating system they are about to install.

4. Hard disk containing the operating system should not be removed to another computer. This could cause the computer not to boot again as the operating system will requires formatting and re-installing of a new operating system to that computer.

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