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Impact of Information and Communication Technology (ICT) on Students' Academic Performance of Kaduna State University, Kaduna State, Nigeria

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Abstract

This study accessed the relationship between ICT tools and academic performance of undergraduate students in Kaduna State University, Kaduna adopting a descriptive survey research design and anchored on the 'constructivist theory'. The population of the study comprised of all undergraduate students in Kaduna State University (Main Campus), Tafawa Balewa Way, Kaduna, while a sample of 350 students was selected using proportionate stratified random sampling technique. The study utilized primary data which were collected using a questionnaire, while data analysis was performed using descriptive statistics (frequency, percentage, mean, and standard deviation) and OLS – multiple regression analysis. Findings from the study revealed that ICT tools have significant positive relationship with the academic performance of undergraduate students in Kaduna State University at 5% level of significance. Findings also revealed that the ICT tools - Internet, Laptop/Desktop, Printer, Browser Phone, and Digital Camera have individual significant positive impacts on the academic performance of undergraduate students in Kaduna State University at 5% level of significance. Hence, the study concludes that ICT tools have significant positive relationship with the academic performance of undergraduate students in Kaduna State University, and the ICT tools - Internet, Laptop/Desktop, Printer, Browser Phone, and Digital Camera have individual significant positive impacts on the academic performance of the students. The study therefore, recommended that management of Kaduna State University should endeavour to provide proper orientation for undergraduate students on how to use, when to use, and purpose for using diverse ICT tools in their academic pursuits in order to achieve and sustain positive academic gains from their utilization, among other recommendations.

Background to the Study

Education is the process of facilitating learning or the acquisition of knowledge, skills, beliefs and habits. Education frequently takes place under the guidance of educators, but learners may also educate themselves. Education in the narrow and common-sense usage is what takes place during the process of teaching in the educational institutions. In this era of globalization and technological evolution, education is considered as a first, prominent step for every human activity. Guided by the National Policy on Information and Communication Technology (ICT) in school education, the education curriculum has been designed to create wider horizons for students and keep them informed of their career pursuits. The prevalence and rapid development of information and communication technologies have transformed human society from the information technology age to the knowledge age (Adegbite, 2017). ICT refers to technologies which provide access to information through telecommunications. It is similar to Information Technology (IT), but focuses primarily on communication technologies. This includes the Internet, wireless networks, cell phones, and other communication medium.

Information and technology have a major role to play in forming the new worldwide economy to deliver fast changes in the society. Within the previous decade, ICT has advanced and changed at such a speed, that developing countries have not been able to catch up with the revolution and have been left behind and thus lag in their communication with the developed countries. ICT acts as the foundation stone of the contemporary world; thus, understanding this technology and its fundamental concepts is considered as part of the core of education (UNESCO, 2002). Technology has the potential to renovate the ways of instruction, where and how learning occurs and the roles of students and educators in the instructional process (UNESCO, 2002). ICT is transforming procedures of instructional process by contributing components of strength to learning situations involving virtual environment. It is an effective and influential instrument for providing educational opportunities; thus, it is difficult to envision future learning situations that are not bolstered by information and communication technology.

Several studies have been conducted both at national and international level on the adoption and usage of ICT tools on the academic performance of students of higher educational institutions such as the studies of Shaikh & Khoja, 2011; Iqbal & Ahmed, 2010). However, only very few studies were conducted to explore how modern technologies impact on students' academic performance at the higher educational institutions in Nigeria. Students' academic performance refers to the enhancement of the students' current state of knowledge and skills reflected in their GPA and also in the formulation of their personality and academic growth from lower levels of study to higher levels. The rationale for assessing students' academic performance in the context of the adoption of ICT tools in academic pursuits is to establish if a significant relationship exists between the two variables. It is against this backdrop that this study attempts to assess the impact of ICT tools on the academic performance of undergraduate students in Kaduna State University, Kaduna State, Nigeria.

Objectives of the Study

The main objective of this study is to access the relationship between ICT tools and academic performance of undergraduate students in Kaduna State University. The specific objectives of the study are:

i.) To investigate the relationship between ICT tools and academic performance of undergraduate students in Kaduna State University.

ii.) To ascertain the impacts of ICT tools on the academic performance of undergraduate students in Kaduna State University.

Scope of the Study

The scope of the study covers only undergraduate students of Kaduna state University (Main Campus) Tafawa Balewa Way, Kaduna in the 2020/2021 academic session. The study also focuses on five ICT tools – Internet, Laptop/Desktop, Printer, Browser Phone, and Digital Camera.

Literature Review and Theoretical Framework

Literature Review

Information and Communication Technology (ICT) is a term that encompasses all forms of technology used to create, store, exchange, and use information in its various forms (business data, voice conversations, images, motion pictures, multimedia presentations, and other forms, including those not yet conceived). It is a convenient term for including both telephony and computer technology in the same word. It is the technology that is driving what has often been called "the information revolution" (Barrow, Markman, and Rouse, 2009). The Association for Computing Machinery in it broadest sense referred to Information and Communication Technology (ICT) as all aspects of computing technology. ICT, as an academic discipline, is concerned with issues related to advocating for users and meeting their needs within an organizational and societal context through the selection, creation, application, integration and administration of computing technologies.

Internet

The need to access the Internet or university intranet would be an essential requirement. This would be due to accessing various resources from Web, file servers and a Virtual Learning Environment (VLE) or course notes. Access could be via the existing wired network or, for greater flexibility, via a wireless network. Since the emergence of the Internet, it has become an important medium of communication as well as a research and leisure tool. The reason is that it provides many opportunities to many people around the world in many different ways. Not only the Internet, but the other new digital technologies also took their places in the daily life. The wide access to these technologies improves people's lives and provides great opportunities. People have started to access any kind of information easily on the Internet and also use it for social, educational and entertainment purposes. Basically, the Internet offers two main benefits which are communication and information (Warren et. al., 1998). On a more comprehensive basis, it can be pointed out that the Internet has some functions, especially in education, and these

can be listed as (i) storehouse of information, (ii) communication without boundaries, (iii) online interactive learning, (iv) electronic/online research, (v) innovation in the new world, (vi) improve interest in learning, (vii) global education, and (viii) information catalogues (Park, 2009).

As the Internet has many different functions, it is important to consider to what extent it is used by students in higher education for academic purposes. When educational aspect of the Internet use is considered, it is obvious that students, or people in general, who look for information can access it easily and with low cost. It is evident that the Internet is a source of enormous information that anything can quickly and easily be reached. Internet also provides students asynchronous education where they can reach any kind of information anytime and anywhere. This widens the world of students as nowadays kids do not like to use libraries or any kinds of real-life resources but they can access these places online and benefit from them easily and quickly. Additionally, the Internet can be used as a tool to learn the latest news all around the world as well as getting any kind of information that serves different purposes such as learning more information about a hobby or health. Therefore, it can be said that the Internet is the source of spreading information quickly to a large audience and of going beyond the limitation of time and space.

Laptop/Desktop

The laptop or desktop computer as an integral part and backbone of Information Science has offered to the field of education a great deal of solutions to various educational problems, as well as new educative methods, revolutionizing the educational process in technology-enhanced learning. Some of its fundamental capabilities in the field of education are: personalized teaching and learning, group collaboration learning, a good way of representing reality, feedback, lifelong education, the connection with the world, and aiding vulnerable social groups and special categories of audiences (Koedinger, Anderson, Hadley, and Mark, 1997). Its main use as a means of teaching is that through simulation, the computer offers a dynamic representation of reality, with methods of virtual and augmented reality, thus allowing learners to interact with the real world in ways that were not possible before (Isaiah and Wagbara, 2019).

Access to computers in schools may improve student outcomes in several ways. Computer software has the potential to provide self-paced instruction that is typically difficult to achieve in group instruction (Koedinger et al., 1997). Likewise, the content of instruction may be individualized to the strengths and weaknesses of the student. Because students can use instructional programs without the direct supervision of a teacher, ICTs and computer aided instruction hold the promise of increasing the overall amount of instruction that students receive (Barrow, Markman, and Rouse, 2009), while still allowing parents and teachers to monitor student progress. The Internet represents a potentially valuable resource for finding out information about a wide range of educational topics for reducing the coordination costs of group projects. Computers, the Internet, software and other technologies, because of their interactive nature, may engage university students in ways that traditional methods cannot (Cuban 2001).

Printer

Printing technology is fascinating opportunity for innovators, inventors and visionaries to fabricate their proposed designs. This technology creates huge impact in multiple fields as well as in maker spaces, universities and elementary schools ((Waseem, Kasmi, and Qureshi, 2017), but the development is slow because of less knowledge and understanding of practitioners. Printing in education is a matter of bringing objects out in the hands of students from computer screens for inspections and practical exposure. It can be used in multiple education areas like, Engineering, Architecture, History, Graphic, Geography, Automotive, Biology, Chemistry, Mathematics, etc. (Butterworth, 2011). This emerging technology enables tangible learning patterns among students which helps them to freely express and present their views and opinions visually on paper (Waseem et al., 2017). Printing turns abstract concepts into physical, relatable objects. It allows students and teachers to design and create a model to help them understand that abstract concept. Printing is therefore a very beneficial tool for spatial and kinaesthetic learners (Waseem et al., 2017).

Browser Phone

Browser phone is a portable mobile phone that includes advanced functions beyond making phone call and sending text messages, many of these browser phones have the ability to display photos and play videos and check and send e-mail plus browse the internet, modern smart phones such as the iPhone and phones depending on the Android operating system that can operate application of a third party which provides limitless functionality. That is, those mobile phones that combine between the characteristics of mobile phones and properties of wireless computers and can download applications and browse the web (Milrad, 2003; Woodill, 2011).

Digital Camera

For many years' photography has been an integral part of journalism but the quality of photographs used in local Nigerian magazines has hardly measured up to international standards until recently. Considering that it was only in the 1990s that the first commercially available digital camera was developed, scholars have generally speculated that improved photographic qualities in many countries might be attributed to the coming of digital cameras (Curtin, 2007; Zelten, 2002; Ifeduba, 2010). This thinking is heightened by the fact that almost all facets of human activities have been directly or indirectly influenced by advances in information and communication technology, ICT, especially in the media sectors (Azi, Dakyes, and Ogunwole, 2013).

Concept of Academic Performance

According to the Merriam-Webster dictionary (2004), performance refers to how well or how badly one carries out something. It also defined 'academic performance' as the way and extent to which students cope with their studies and how they accomplish different tasks given to them by their teachers. This implies that academic performance is the ability to study and acquire knowledge, and to be able to communicate the knowledge through verbal or written means. Eyo (2012) observed that a nation's strength largely

depends on the quantity and quality of her human resources, and education is the pivot upon which development rotates. He further observed that, quality and quantity of human resources are possible through excellent academic performance. Academic performance is the extent to which a student, teacher or institution have achieved their short-or-long term educational goals. It is commonly measured through examination or continuous assessment for instance, number of credits obtained at a sitting in WAEC or NECO examination represents academic performance of the candidate. Students' academic performance is contingent upon a number of factors including: previous educational outcome, socio economic status of the parents, parent educational background, self- effort and self -motivation of students, learning preferences, standard and type of educational institution in which student get their education and the school in which they study, amongst others.

ICT and Students' Academic Performance

Modern technologies such as computers and telecommunications have been the most remarkable and transformative of the technologies emerging over the past 30 years. Therefore, numerous literatures have been reported on the evaluation of the level of the adoption and usage of ICT tools by the students for enhancing their academic performance. Oye et al. (2014) expressed that the usage of ICT has brought improvement in human knowledge. The authors further argued that the adoption of ICT in educational institutions has built an information bridge between the students and teachers. Furthermore, Hennessy et al. (2005) stated that ICT opens multiple doors for teachers and students to use technology for their academic activities. Moreover, Wang and Woo (2007) reported that the term ICT was not new for educational institutions it is as old as television and radio. But the emergence of new technologies like WWW has attracted the students and teachers to adopt ICT for teaching and learning purposes.

Theoretical Framework

Constructivist Theory

This study is anchored on the constructivist theory. The theory is backed up by the work of Seymour Papert (1980) who proved that computers are useful in higher learning. Papert's view of the importance of motivational engagement of the learner contrasts sharply with Skinner's who although recognizing this influence, consider it unnecessary for instruction. In this view, the learners as active participants are involved in structuring their own learning experiences. Papert's work with Piaget who emphasized the way in which knowledge is structured using computers are organized as well as how the learners' own perception of their prior experiences performs the knowledge structure. Thus, the importance of how a learner relates new experiences to existing knowledge becomes paramount. There are several theories that have heavily influenced the development of educational software towards learning. Social constructivism upholds that knowledge develops as a result of social interaction and is not an individual possession but a shared experience. Bodner (1986) suggests that social constructivism could be applied in the classroom using such instructional methods as case studies, research projects, problem-based learning, brainstorming, collaborative learning/group

work, guide discovery learning, simulations among others. Social constructivism is important because it defines the teacher's role in the teaching/learning process. This implies that teachers should adopt teaching methods that are:

i. Learner centred: here the focus is on the students rather than the teacher. This means the students are urged to be actively involved in their own process of learning. They are allowed to come up with their own ideas, questions, definitions and make-ups.
ii. Collaborative in nature: here emphasis is placed on learning through social interaction. This is done by making students to work in groups to solve problems, investigate and explore topics/situations in order to arrive at conclusions. By so doing they discover or construct knowledge by themselves.
iii. Teacher guided: In social constructivist classrooms collaborative learning is a process of peer interaction that is mediated and structured by the teacher. Discussion can be prompted by the presentation of specific concepts, problems or scenarios, and is guided by means of effectively directed questions, the introduction and clarification of concepts and information, and references to previously learned material.

Review of Related Empirical Studies

Many empirical studies were conducted by researchers to investigate the relationship between information and communication technology (ICT) and students' performance in Nigeria and other countries using diverse methodologies and tools. These studies revealed different findings with either positive or negative relationships which were either statistically significant or insignificant. Some of these studies are reviewed in this sub-section of the review of literature review chapter of this study.

Isaiah, and Wagbara (2019) conducted a study that investigated the influence of information and communication technology (ICT) on the academic performance of social studies students in secondary schools in Port Harcourt Metropolis, Rivers State adopting a descriptive survey research design. The population of the study was 22,703 respondents, which consist of 2,019 teachers and 20,684 students of the 36 junior secondary schools in Obio-Akpor and Port Harcourt Local Government Areas of Rivers State. A sample of 677 was randomly selected from 10 randomly selected junior secondary schools using the simple random sampling technique. Data for the study were collected using a questionnaire, while data analysis was carried out using mean statistics and Z-test. Findings from the study revealed that information communication technology (ICT) influences students' academic performance in social studies. Findings also revealed that computer, projector, Television and Telecom-equipment influenced the academic performance of social studies students.

Adegbite (2017) examined the effect of ICT on the performance of secondary school students in Oyo State, Nigeria adopting a survey research design. The population of the study comprised of all the secondary schools in Oyo State, while a sample of 250 secondary schools was selected using stratified random sampling technique. Data for the

study were collected using questionnaire, while data analysis was done using Chi-Square test Multivariate Analysis of Variance (MANOVA). Findings from the study revealed that ICT has positive significant impact on the performance of secondary school students in Oyo State.

Jibrin, Musa, and Shittu (2017,) investigated the effects of internet on the academic performance of students in tertiary institutions within Niger state, Nigeria adopting a descriptive survey research design. The population of the study consists of all the students of tertiary institutions in Niger State, while a sample of 300 students was selected from three randomly selected institutions using stratified random sampling technique. Data for the study were collected using a questionnaire, while data analysis was carried out using descriptive statistics. Findings from the study revealed that internet has significant positive influence on the academic performance of students in the tertiary institutions in Niger state.

Emeka and Nyeche (2016), investigated the impact of internet usage on the academic performance of undergraduate students in University of Abuja adopting a survey research design. The population of the study comprised of entire undergraduate students of the University of Abuja including 500 level law students which brings the population of the study to 15,000 students, while a sample of 375 was selected using stratified random sampling technique. Data for the study were collected using a questionnaire, while data analysis was done using frequency/percentage distribution analysis. Findings from the study revealed that undergraduate students utilized the internet for study purpose. Findings also revealed that the internet has a direct and proportional relationship with the academic achievement of undergraduate students in the University of Abuja.

Eguaveon (2016), examined the relationship between information and communication technology (ICT) utilisation and academic performance of students with visual impairment in Lagos State adopting ex-post facto correlational research design. The population of the study consists of all students with visual impairment in two secondary schools in Lagos State - Federal Government
College, Ijanikin with 15 students with visual impairment and Queen's College, Lagos with 13 students with visual impairment. Due to the small population size, the total population was used as the sample size for the study. Data for the study were collected using questionnaire, while data analyses were carried out using descriptive statistics (mean and standard deviation) and Pearson product moment correlation analysis. The results of the data analyses revealed that there was significant positive relationship between information and communication technology (ICT) utilization and academic performance of students with visual impairment in Lagos State.

Ali (2018), analyzed the impact of internet use on the academic performance of students and student-teacher relationship using a case study research design. The population of the study comprised of the entire students enrolled in four schools of UAE - Al Noor School in Sharjah, Al Shoula School in Sharjah, Al Hikma School in Ajman, and Dubai

International School in Dubai, while a sample of 400 was selected for the study. Data for the study were collected using a questionnaire, while data analysis was done using descriptive statistics (mean and standard deviation), frequency/percentage distribution analysis, Pearson correlation analysis, and regression analysis. Findings from the study suggested that internet has a negative impact on student's teacher relationship; thus, adversely influencing negatively the academic performance of the students.

Kaur (2018) examined the extent of mobile phone usage and its influence on the academic performance of students of Chandigarh University, Gharuan adopting a survey research student. The population of the study comprised of the entire graduate and undergraduate students of the Chandigarh University, Gharuan, while a sample of 50 students was selected for the study using purposive sampling technique. Data for the study were collected using a questionnaire, while data analysis was done using frequency/percentage distribution analysis. Findings from the study suggested that mobile phone usage influenced negatively the academic performance of students.

Ullah, Alam, and Shan-A-Alahi (2019) examined the effect of ICT on students' academic performance at different private universities in Chittagong, Bangladesh adopting a survey research design. The population of the study comprised of the entire students of International Islamic University, Chittagong, Premier University, Chittagong, BGC Trust University, Port City International University, Chittagong, Independent University, Chittagong, and East Delta University, Chittagong. However, a sample of 210 students was randomly selected for the study. Data for the study were collected using a questionnaire, while data analysis was carried out using frequency/percentage distribution analysis, multiple regression analysis, and Structural Equation Modelling. Findings from the study revealed that that there is a significant positive relationship between ICT use and students' academic performance.

Identified Gaps in Prior Studies

It can be observed from the review of empirical studies that majority of the studies on the relationship between ICT and academic performance were conducted outside Nigeria with none investigating the impact of printer and digital camera as ICT tools on academic performance. It is also observed that only very few of these empirical studies reviewed were conducted in Nigeria with almost none conducted in the Northwest region of the country. Consequently, the aforementioned are the gaps identified in prior related empirical studies which this present study is going to fill.

Methodology

Research Design

Based on the fact that this study attempts to evaluate the relationship between ICT tools and academic performance of undergraduate students in Kaduna State University, a descriptive survey research design was adopted.

Population of the Study

The population of this study is the total number of undergraduate students in the main campus of Kaduna State University, Tafawa Balewa Way, Kaduna during the 2020/2021 academic session. There are six academic faculties in the main campus of the university. These are; Arts, Management Sciences, Social Sciences, Science, Pharmaceutical Sciences, and Medical Sciences. This implies that the population of this study comprises of the total number of undergraduate students in all the six faculties in the main campus of the university which as at the time of conducting the study was not known with high confidence. However, the study assumes that the population is population greater than 10,000.

Sample Size of the Study

In order to attain a high level of precision in the study, an ideal sample size was determined using Cochran sample size determination method (Cochran, 1977). The Cochran sample size determination formula is given as:

$$n = \frac{z^2 pq}{d^2}$$

Where:
n = Ideal sample size
z= Standard normal distribution critical value of a desired confidence level
p = Estimated proportion of an attribute present in the population
q = Estimated proportion of the absence of the attribute in the population (q = 1 – p)
d = Acceptable margin of error

The desired confidence level in this study is 95%. Therefore, the standard normal distribution critical value corresponding to 95% (two-tailed) is ±1.96. In other words, z = 1.96.

The estimated proportion of an undergraduate student in the population is assumed to be 0.65. This implies that p = 0.65. This also implies that q = 1 – 0.65 = 0.35. Since the desired confidence level for the study is 95%, it implies that the acceptable margin of error in the study is 5%. In other words, d = 5% or 0.05.

Since z = 1.96, p = 0.65, q = 0.35, and d = 0.05, the ideal sample size (n) for this study is estimated as:

$$n = \frac{1.96^2(0.65)(0.35)}{0.05^2}$$
$$n = \frac{3.8416\ X\ 0.2275}{0.0025}$$
$$n = \frac{0.8740}{0.0025}$$
$$n = 349.6 \approx 350$$

This implies that an ideal sample size of 350 undergraduate students is required to conduct this study in order to achieve at least 95% accuracy from its findings.

Sampling Technique

Based on the fact that the study intends to select undergraduate students from the six faculties in the main campus of the university, and due to time and financial constraints to investigate all the students in all the six faculties in the campus, the study used simple random sampling technique to select one department each from each faculty. Consequently, a proportional stratified random sampling technique was used in the selection of students from the randomly selected departments to be respondents in the study. The results of the simple random sampling technique are shown in Table 1:

Table 1: Randomly Selected Departments from each Faculty in the Main Campus

S/N	Faculty	Department	No. of Undergrad. Students
1.	Arts	English	348
2.	Management Sciences	Business Administration	402
3.	Medical Sciences	Medicine	82
4.	Pharmaceutical Sciences	Pharmacy	91
5.	Science	Geography	268
6.	Social Sciences	Sociology	385
	TOTAL		**1,576**

Source: Outputs of Researcher's Simple Random Sampling Technique, 2021.

The Bowley's proportional allocation method (Neter, Wasserman, & Whitmore, 2002) was used in allocating sample sizes to each selected department relative to the number of undergraduate students in the department. The Bowley's proportional allocation formula is given as:

$$n_k = \frac{n.N_k}{N}$$

Where:
n_k = Sample size for stratum h
N_k = Population size for stratum h
N = Total population size
n = Ideal minimum sample size

With the Bowley's formula, sample sizes were proportionally allocated to each randomly selected department. Since the total number of undergraduate students in the six randomly selected departments was 1,576, it implies that N = 1,576. Since the ideal sample size for the study was 350, it implies that n = 350. N_k refers to the total number of undergraduate students in each randomly selected department. Here, the N_k's are N_1, N_2, N_3, N_4, N_5, and N_6. Accordingly, the Bowley's proportional allocations for the randomly selected departments were determined as follows:

Using N = 1,576 and n = 350, it implies that:
For English, N_1 = 348. This implies that:

$$N_1 = \frac{350\ X\ 348}{1576} \approx 77.$$

For Business Administration, $N_2 = 402$. This implies that:

$$N_2 = \frac{350\ X\ 402}{1576} \approx 89.$$

For Medicine, $N_3 = 82$. This implies that:

$$n_3 = \frac{350\ X\ 82}{1576} \approx 18.$$

For Pharmacy, $N_4 = 91$. This implies that:

$$n_4 = \frac{350\ X\ 91}{1576} \approx 20.$$

For Geography, $N_5 = 268$. This implies that:

$$n_5 = \frac{350\ X\ 268}{1576} \approx 60.$$

For Sociology, $N_6 = 385$. This implies that:

$$N_6 = \frac{350\ X\ 385}{1576} \approx 86.$$

A summary of the outputs of the Bowley's proportional allocations is given in Table 2:

Table 2: Proportional Allocations of Sample Size to the Selected Departments

S/N	Department	Population Size	Proportional Allocation
1.	English	348	77
2.	Business Administration	402	89
3.	Medicine	82	18
4.	Pharmacy	91	20
5.	Geography	268	60
6.	Sociology	385	86
	TOTAL	**1,576**	**350**

Source: Outputs of Researcher's Bowley's Proportional Allocation Calculations, 2021.

Instrument for Data Collection

A questionnaire was the main instrument used in collecting data in this study. The questionnaire is divided into three parts – A, B, and C, and contains mostly structured closed-ended questions and has two sections – A and B. Section A contains close-ended questions that attempt to know respondents' socio-demographic characteristics such as gender, age category, department, level (class), and GPA/CGPA. Respondents were required to select only one answer-option for each question as it best relates to them from the available multiple answer-options for each question in the section. Section B contains close-ended questions that attempt to know the frequency of utilization of the ICT tools by undergraduate students for academic purposes. The questions in this section are framed on a 5-point Likert scale answer-options (5 = Always, 4 = Very Often, 3 =

Sometimes, and 2 = Seldom, 1 = Never) and respondents are required to select only one answer-option for each question to indicate the frequency of utilization of each tool.

Validity of Instrument

The study used face validity method to validate the questionnaire in this study. The instrument was given to two lecturers in Kaduna State University and two independent researchers to peruse the contents and evaluate. After this exercise, the results of the evaluations were transmitted back to the researcher with some comments and corrections which the researcher acknowledged and adopted. The evaluation results however, revealed a high level of agreement between the validators, which is an indication that instrument is valid for use in the collection of data in the study.

Reliability of Instrument

The internal consistency method was used in determining the reliability of the instrument for data collection in this study. The Cronbach's alpha test was used to accomplish this. The Cronbach's alpha test returned an alpha coefficient of 0.741, which is an indication that instrument is of good reliability and consistency.

Variables in the Study

The variables used in this study are classified as; dependent and independent variables. The dependent variable is "Academic Performance", proxied by the GPA/CGPA of the students (measured on a continuous scale of 0.0 to 5.0), while the independent variables are the frequencies of utilizations of the ICT tools - Internet, Laptop/Desktop, Browser Phone, Printer, and Digital Camera.

Model Specification

The statistical model in this study illustrates the relationship between utilization of ICT tools and the academic performance of undergraduate students in Kaduna State University. This model is given as:

$$\mathbf{Y_i = \beta_0 + \beta_1 X_{1i} + \beta_2 X_{2i} + \beta_3 X_{3i} + \beta_4 X_{4i} + \beta_5 X_{5i} + \varepsilon_i} \text{ ---------- (2)}$$

Where;
Y = Academic Performance (Dependent Variable)
X_1 = Internet (Independent Variable)
X_2 = Laptop/Desktop (Independent Variable)
X_3 = Printer (Independent Variable)
X_4 = Browser Phone (Independent Variable)
X_5 = Digital Camera (Independent Variable)
β_0 = Intercept (Constant) of the model
β_1- β_5= Slopes of the model (Coefficients of the Independent Variables X_1 - X_5)
ε_i = Error Term
i = Student (i = 1 to n)

Method of Data Analysis

The data collected in this study with questionnaire were analyzed using descriptive statistics (frequency, percentage, mean, standard deviation) and OLS - Multiple regression analysis. The analyses were carried out with the aid of the Statistical Package for the Social Sciences version 25 (SPSS 25.0).

Results and Findings

Response Rate Analysis

A total of 350 copies of the questionnaire were administered to the selected respondents in this study. However, only 287 completely filled copies were returned/retrieved. This implies that the study achieved a response rate of 82.0%, which is deemed to be a satisfactory rate for the study to be conducted. In view of this, 287 was used as the basis for data analysis in the study and not 350. The response rate analysis in the study is given in Table 3:

Table 3: Response Rate Analysis

Questionnaires Administered	Valid Questionnaires Returned/Retrieved	Response Rate
350	287	82.0

Source: Output of Researcher's Response Rate, 2021.

Cronbach's Alpha Reliability Test

Cronbach's alpha reliability test was used in determining the internal consistency and reliability of the questionnaire in this study. As a rule of thumb, researchers only regard an instrument as reliable and consistent if it has at least a Cronbach's alpha coefficient of 0.60. Consequently, the result of the Cronbach's alpha reliability test performed in this study returned an alpha coefficient of 0.741, which is an indication that the questionnaire has good internal consistency and reliability. The results of the Cronbach's alpha reliability test are given in Table 4:

Table 4: Reliability Statistics

Cronbach's Alpha	Number of Items
0.741	25

Source: Output of Researcher's Cronbach's Alpha Test, 2021.

Frequency/Percentage Analysis of Respondents' Socio-Demographic Characteristics

Table 5: Socio-Demographic Characteristics of Respondents

Variable	Frequency	Percent
Gender		
Male	158	55.1
Female	129	44.9
Total	**287**	**100.0**
Age Category		
< 18 years	15	5.2
18-21 years	142	49.5
22-25 years	85	29.6
26-29 years	41	14.3
30 years and above	4	1.4
Total	**287**	**100.0**
Department		
English	67	23.3
Business Administration	74	25.8
Medicine	13	4.5
Pharmacy	15	5.2
Geography	47	16.4
Sociology	71	24.7
Total	**287**	**100.0**
Level (Class)		
100Level	30	10.5
200Level	137	47.7
300Level	81	28.2
400Level	36	12.5
500Level	3	1.0
Total	**287**	**100.0**
GPA/CGPA		
< 1.00	11	3.8
1.00-1.99	22	7.7
2.00-2.99	45	15.7
3.00-3.99	139	48.4
4.00-5.00	70	24.4
Total	**287**	**100.0**

Source: Researcher's Field Survey, 2021.

Table 5 shows the distributions of the socio-demographic characteristics of respondents in this study. The first panel of the Table indicates that 158(55.1%) of the respondents were males, while 129(44.9%) were females. This implies that majority of the respondents in this study were males. The second panel indicates that most of the respondents 142(49.5%) of the respondents in the age category of 18-21 years, while the least 4(1.4%) were in the age category of 30 years and above. This implies that majority of the respondents were in the age category of 18-21 years. The third panel indicates that most of the respondents 74(25.8%) were from Department of Business Administration, while the least 13(4.5%) were from Department of Medicine. This implies that majority of the

respondents in this study were from the Department of Business Administration. The fourth panel indicates that most of the respondents 137(47.7%) were in 200 Level, while the least 3(1.0%) were in 500 Level. This implies that majority of the respondents in this study were in 200 Level. The fifth indicates that most of the respondents 139(48.4%) had GPA/CGPA of 3.00-3.99, while the least 11(3.8%) had GPA/CGPA of less than 1.00. This implies that majority of the respondents in this study had GPA/CGPA of 3.00-3.99.

Frequency/Percentage Analysis of Frequencies of Utilization of ICT Tools for Academic Purposes

Table 6: Frequencies of Utilization of ICT Tools for Academic Purposes by Respondents

Variable	Frequency	Percent
Internet		
Never	0	0.0
Seldom	42	14.6
Sometimes	75	26.1
Very Often	111	38.7
Always	59	20.6
Total	**287**	**100.0**
Laptop/Desktop		
Never	0	0.0
Seldom	35	12.2
Sometimes	81	28.2
Very Often	119	41.5
Always	52	18.1
Total	**287**	**100.0**
Printer		
Never	0	0.0
Seldom	62	21.6
Sometimes	104	36.2
Very Often	53	18.5
Always	68	
Total	**287**	**100.0**
Browser Phone		
Never	0	0.0
Seldom	61	21.3
Sometimes	65	22.6
Very Often	91	31.7
Always	70	24.4
Total	**287**	**100.0**
Digital Camera		
Never	58	20.2
Seldom	68	23.7
Sometimes	75	26.1
Very Often	55	19.2
Always	31	10.8
Total	**287**	**100.0**

Source: Researcher's Field Survey, 2021.

Table 6 shows the distributions of frequencies of utilization of ICT tools for academic purposes. The first panel of the Table indicates that most of the respondents 111(38.7%) very often utilized the internet, while the least 0(0.0%) never utilized it. This implies that majority of the respondents in this study very often utilized the internet for academic purposes. The second panel indicates that most of the respondents 119(25.8%) very often utilized laptop/desktop, while the least 0(0.0%) never utilized it. This implies that majority of the respondents in this study very often utilized laptop/desktop for academic purposes. The third panel indicates that most of the respondents 104(36.2%) sometimes utilized printer, while the least 0(0.0%) never utilized it. This implies that majority of the respondents in this study sometimes utilized printer for academic purposes. The fourth panel indicates that most of the respondents 91(31.7%) very often utilized browser phone, while the least 0(0.0%) never utilized it. This implies that majority of the respondents in this study very often utilized browser phone for academic purposes. The fifth panel indicates that most of the respondents 75(26.1%) seldom utilized digital camera, while the least 31(10.8%) always utilized it. This implies that majority of the respondents in this study seldom utilized digital camera for academic purposes.

Multiple Regression Analysis

An OLS - multiple regression analysis was used in determining the relationship between ICT tools and academic performance of undergraduate students in Kaduna State University. The results of the analysis are given in Tables 7, 8, and 9:

Table 7: Model Summary

R	R Square	Adjusted R Square	Std. Error	Durbin-Watson
0.965	0.932	0.931	.1694	1.893

Source: Researcher's SPSS OLS - Multiple Regression Analysis Output, 2021.

Table 7 shows that the coefficient of multiple correlation (R) = 0.965, which is an indication that there is 96.5% positive association between the ICT tools (internet, laptop/desktop, printer, browser phone, and digital camera) and academic performance of undergraduate students in Kaduna State University. The Table also shows that the coefficients of multiple determination (R^2) and Adjusted R^2 are 0.932 and 0.931 respectively. These measures indicate that with the multiple regression model in this study, about 93.1% to 93.2% of the observed variations in academic performance of undergraduate students in Kaduna State University were explained the ICT tools (internet, laptop/desktop, printer, browser phone, and digital camera); while only 6.8% to 6.9% of the variations were explained and captured in the error term of the model. The Table also indicates that the standard error of the model is 0.1694, which is small relative to the mean of the dependent variable (academic performance) which is 3.82. In statistics, a relatively small standard error value of a model indicates that the model is reliable and provides a good fit for the observed data used in estimating the model, while a relatively high standard error value indicates that a statistical model is not reliable and fails to provide a good fit for the observed data used in estimating the model. Therefore, since the

standard error value of the multiple regression model (0.1694) is small relative to the mean of academic performance (3.82), it implies that multiple regression model in this study is reliable and provides a good fit for the observed data used in estimating the relationship between the ICT tools (internet, laptop/desktop, printer, browser phone, and digital camera) and academic performance of undergraduate students in Kaduna State University. The Table also indicates that Durbin-Watson (D-W) statistic of the model is 1.893. Since this value is close to 2.0, it implies that the multiple regression model is robust and does not have the problem of autocorrelation.

Table 8: ANOVA

Model	Sum of Squares	DF	Mean Square	F	Sig.
Regression	110.307	5	22.061	768.784	0.000
Residual	8.064	281	.029		
Total	118.371	286			

Source: Researcher's SPSS OLS - Multiple Regression Analysis Output, 2021.

Table 8 is the regression ANOVA Table. The Table reveals the overall statistical significance of the multiple regression model that explains the relationship between the ICT tools (internet, laptop/desktop, printer, browser phone, and digital camera) and academic performance of undergraduate students in Kaduna State University using the F statistic. From the Table, F = 768.784, DF = (5, 281), and P = 0.000. Since the associated P value is less than the level of significance value (0.000 < 0.05), it implies that the multiple regression model used in explaining the relationship between ICT tools (internet, laptop/desktop, printer, browser phone, and digital camera) and academic performance of undergraduate students in Kaduna State University is statistically significant at 5% ($F_{(5, 281)} = 768.784, P < 0.05$).

Table 9: Multiple Regression Coefficients

	B	Std. Error	t	P
(Constant)	-.460	.147	-3.131	.002
INT	.195	.028	7.053	.000
LAP	.026	.012	2.121	.035
PRNT	.381	.029	13.106	.000
BPHN	.337	.026	13.187	.000
DCAM	.219	.041	5.370	.000

Source: Researcher's SPSS OLS - Multiple Regression Analysis Output, 2021.

Table 9 is the regression coefficients table that shows the estimated regression coefficients for the multiple regression model in this study. The Table shows the value of the intercept (constant) of the model, coefficients of the independent variables, t-values, and the corresponding P-values for the independent variables. From the Table, it can be observed that the intercept (constant) of the model is negative and statistically significant at 5% ($\beta_0 = -0.460, t = -3.131, P = 0.002$). The Table also shows that INT has a positive and statistically

significant impact on APERF at 5% level of significance (β_1 = 0.195, t = 7.053, P = 0.000). The Table also shows that LAP has a positive and statistical significant impact on APERF at 5% level of significance (β_2 = 0.026, t = 2.121, P = 0.035).The Table also shows that PRNT has a positive and statistical significant impact on APERF at 5% level of significance (β_3 = 0.381, t = 13.106, P = 0.000).The Table also shows that BPHN has a positive and statistical significant impact on APERF at 5% level of significance (β_4 = 0.337, t = 13.187, P = 0.000).The Table also shows that DCAM has a positive and statistical significant impact on APERF at 5% level of significance (β_5 = 0.219, t = 5.370, P = 0.000).

Based on the regression coefficients in Table 9, it implies that the estimated multiple regression model that explains the relationship between ICT tools (internet, laptop/desktop, printer, browser phone, and digital camera) and academic performance of undergraduate students in Kaduna State University can be written mathematically as:

$$\mathbf{APERF_i = -0.460 + 0.195INT_i + 0.026LAP_i + 0.381PRNT_i + 0.337BPHN_i + 0.219DCAM_i + \varepsilon_i}$$

Discussion of Major Findings

The results of the frequency/percentage analysis revealed that majority of the respondents in the study were males, majority were in the age category of 18-21 years, majority were in the Department of Business Administration, majority were in 200 Level, and majority had GPA/CGPA between 3.00-3.99.

The results of the OLS – multiple regression analysis revealed that Internet had significant positive impact on the academic performance of undergraduate students in Kaduna State University. This finding is consistent with in findings of Emeka and Nyeche (2016) and Jibrin et al. (2017), whose studies revealed that Internet had significant positive influence on the academic performance of students. The finding is however, inconsistent with the findings of Ali (2018) whose study found that Internet had significant negative impact on the academic performance of students. The results of the OLS – multiple regression analysis also revealed that Laptop/Desktop had significant positive impact on the academic performance of undergraduate students in Kaduna State University. This finding agrees with the finding of Isaiah and Wagbara (2019) whose study found that computer influenced the academic performance of social studies students in Port Harcourt.

The results of the OLS – multiple regression analysis also revealed that Printer had significant positive impact on the academic performance of undergraduate students in Kaduna State University. This finding somehow, supports the findings of Ullah et al. (2019), Eguaveon (2016), and Adegbite (2017) whose studies revealed that ICT tools have positive influence on the academic performance of students. The results of the OLS – multiple regression analysis also revealed that Browser Phone had significant positive impact on the academic performance of undergraduate students in Kaduna State University. This finding upholds the finding of Rabiu et al. (2016) whose study found that mobile phone had significant positive influence on the academic performance of male and female senior secondary school students. The finding is however, inconsistent with

the findings of Kaur (2018) whose study revealed that mobile phones negatively influenced the academic performance of students.

The results of the OLS – multiple regression analysis also revealed that Digital Camera had significant positive impact on the academic performance of undergraduate students in Kaduna State University. This finding somehow, upholds the findings of Ullah et al. (2019), Eguaveon (2016), and Adegbite (2017) whose studies revealed that ICT tools impacted positively on the academic performance of students.

Conclusion

Based on the findings from the results of the data analysis, this study concludes that ICT tools have significant positive relationship with the academic performance of undergraduate students in Kaduna State University, and the ICT tools - Internet, Laptop/Desktop, Printer, Browser Phone, and Digital Camera have individual significant positive impacts on the academic performance of the students.

Recommendations

1. Management of Kaduna State University should endeavour to provide proper orientation for undergraduate students on how to use, when to use, and purpose for using diverse ICT tools in their academic pursuits in order to achieve and sustain positive academic gains from their utilization.
2. Undergraduate students should also be encouraged to continually focus on the utilization of ICT tools in their academic pursuits as these tools have the tendency to aid them effectively communicate, share academic/research materials among themselves, store and retrieve academic resources/materials for future use which will further help to boost their academic performance.
3. Undergraduate students in Kaduna State University should also be encouraged to explore and use other ICT tools in their academic pursuits, apart from those assessed in this study.

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