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Information and Communication Technology Availability, Utilization and Research Work Performance among Postgraduate Students in South-South Universities, Nigeria

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Abstract
Guided by two null hypotheses, the aim of this study was to investigate Information and Communication Technology (ICT) Availability, Utilization and Research Work Performance among Postgraduate Students in South-South Universities, Nigeria. The population of the study was 24,230 postgraduate students. The independent variable was ICT (categorised into availability and utilization) and the dependent variable was research work performance. Ex-post facto research design was used. Stratified sampling technique was deployed to sample 510 postgraduate students in South-South universities. Data were collected using Information and Communication Technology Availability, Utilization and Research Work Performance Questionnaire (ICTAURWPQ). The hypotheses were tested at .05 alpha level using one-way analysis of Variance. The results obtained showed that there is a significant influence of ICT availability and utilization for research on postgraduate students' research work performance. From the results, it was concluded that the consequences of lack of adequate ICT research facilities will result to poor research work performance among postgraduate students. It was recommended among others that the Federal Ministry of Education through the National Universities

Commission (NUC) should equip all universities, especially post graduate e-libraries, with functional ICT gadgets to facilitate research work among students.
Keywords: ICT, availability, utilization, research, performance

Introduction

Research is a scientific process of searching for the truth about realities and behaviour. Since human beings are part of nature, there are "truths" hidden in each student which education is to bring out and develop. In other words, there are some truths in terms of potentials, traits, or general behaviour inherent in every students which education by its purpose is to find out and then develop. Finding out the truth about human is tantamount to creating knowledge about realities and behaviour. The process of creating knowledge has been developed and validated through science. According to Brubacher (2009), like medicine, education science is based on other sciences; it does not have a science of its own. Education science or educational research is therefore the application of scientific methodology in the search for truth about human behaviour (Ojini et al., 2017).

The process of creating knowledge consists of three steps: pose a question, collect data to answer the question, and present an answer to the question (Creswell, 2008). According to Ojini et al. (2015), the major steps in conducting research are:

> identification of research problem, literature review, specifying the purpose of research, determine specific research questions, specification of framework - usually a set of hypotheses, choice of a methodology (for data collection), data collection, analyzing and interpreting the data, reporting and evaluating research and communicating the research findings and, possibly, recommendations" (p. 2).

Going by this definition, it means that research is not just gathering of information or rearranging of paragraphs from encyclopedia or web pages but asking real questions and finding solutions to them. In tertiary education, it is not only undergraduate students or the lecturers that carry out research, postgraduate students too engage in serious academic research in solving societal problems.

Saron (2005) sees postgraduate research as a form of assessment, designed by National Universities Commission (NUC) to test student's knowledge in locating and organizing materials, comprehending a topic, and/or applying a concept to a specific context in solving environmental problems. This definition recognizes the art of critical, and ethical judgment in research. The above descriptions of postgraduate research writing agree that First Degree research projects are designed with the intent of creating new knowledge. The students benefit from the research experience of the supervisors who build confidence, offer encouragement, and provide guidance and assistance for the students' future education and career development. This process served as fundamental of research work for doctorate degree students in Nigerian universities. Consequently, since research knowledge determines their relevance and future within postgraduate research which doubles as one of the basis for the international rating of their affiliated university, acquisition of such knowledge is imperative for higher education and the development of such knowledge is also paramount; therefore it is an overriding duty of education,

especially university education, to ensure such acquisition among its graduates (Velho, 2004).

The acquisition of such skills in research work performance requires the availability and utilization of ICT gadgets to bring out productive research work performance at the local and international standard. However, globalization and technological changes have accelerated and also created a new global research tool powered by information and communication technology (ICT). The emergence of this new global approach to education has serious implications for the nature and purpose of educational research. ICT has become, within a very short time, one of the basic building blocks of modern research. ICT is defined as the totality of electronic means used to collect, store, process and present information to end-users in support of their activities. It also refers to activities or studies involving computers hardware and software and other electronic technologies. It consists of computer system, Microsoft office systems and consumer electronics, as well as networked infrastructure, the components of which include the Microsoft excel spreadsheet, power point presentation, word processing, the Internet, fax machines and various handheld devices. Thus ICT could be seen as the combination of networks, hardware and software as well as the means of communication, collaboration and engagement that enable a meaningful processing, management and exchange of data and information in research finding (Ezekoka, 2008). ICTs have successfully changed the social, economic and political spaces globally and the educational system is not left out.

In Watson (2005) description, ICTs have revolutionized the way people work today and are transforming educational system even now. The question to answer is: are ICT gadgets available and utilized in research among postgraduate students in south-South universities? To be available means to be physically present, while availability refers to the condition of being present, especially of being accessible or obtainable. Availability of ICT resources in education means students should be able to access ICT resources like computer, printers, multimedia and phones within and outside the university environment. It is unfortunate that many Nigerian universities offer computer science courses without computer laboratories, let alone Internet connectivity. E-libraries have become archives of desktop, computer wearied gadgets parts, and irrelevant research materials.

To “utilize” means to make use of something, or to find a particular or effective use for something; while “use” on its part means to put something into action or service for some purpose. Therefore utilization of ICT resources simply means using ICT resources or putting ICT resources into use. Furthermore, the ICT resources to be utilized in this study are internet resources, phones and multimedia resources, such as projector, to enhance student’s research knowledge. If ICT is fully utilized, it can be seen as a way to promote educational change, improve the knowledge of learners, prepare students for examination and global economy and information society (McNamara, 2008). Utilization of ICT resources improves delivery and access to education, increases quality of education thereby increase the impact of education on the economy of a nation; it also improves access to learning by all (Kaino, 2007).

Observation has shown that students in general and postgraduates in particular still conduct research using the traditional approach. The traditional approach has hindered

application of research knowledge among postgraduate students in various disciplines (Sabo, 2005). The challenge is that postgraduate students cannot probably conduct acceptable local and international standard research resulting to knowledge creation unless and until research ICT skill is clearly activated and applied in conducting research.

Ojini (2015) conducted a study on the influence of ICT training for research on application of research skills among College of Education lecturers in Akwa Ibom and Cross River states in Nigeria. Using 550 lecturers as the sample, one way analysis of variance was used for data analysis. The results revealed that ICT training significantly influenced problem identification skill, question/hypothesis formulation skill, literature review skill, sampling technique skill, instrumentation development skill, use of statistical tools skill, computer application in data analysis, referencing skill, and report writing skill. Akuegwu et al. (2011) reported that ICT has the potential to accelerate, enrich and deepen students' knowledge, motivate and engage students in research work. Consequently, the availability of ICT tools in the universities has greatly increased research knowledge among graduate students

Azuka (2011) remarked that Microsoft Excel provides good capabilities for doing statistical analyses. Postgraduate students of universities who do not acquire the knowledge and proficiency in the use of Microsoft Excel may suffer because lack of research knowledge of this package is detrimental to students' competence in both learning and research knowledge. Also, Amenyedzi et al. (2011) carried out a study on the use of computers and internet as supplementary source of educational research material in senior high schools in the Tema metropolis in Ghana. The study was aimed at assessing computer and internet usage as supplementary educational material to enhance quality education; help improve educational management and planning; how students use the computers and internet to facilitate their learning; how teachers in the Tema senior high schools use the computers and internet to teach and guide students. Stratified sampling method was used to select students and teachers for research. The results showed that a high percentage of respondent teachers (92%) were computer literate and 78% of respondent students also had basic research knowledge in computer. However, less than 15% of these teachers used the internet as an innovative way of improving teaching and learning. Over 30% of the postgraduate students used the computer mainly for research work.

In a similar study on the role of computer technologies in research knowledge acquisition, Nemani (2010), affirms that there is a strong connection between the computer technologies and their role in research knowledge acquisition in an education settings. He further said that computer technologies are capable of assisting research knowledge seekers and experts engaged in different types of research knowledge acquisition process such as formulate research topics, state research problems, formulate hypotheses, and organize relevant literature review using the Internet, to construct suitable methodology, adapt appropriate data analysis techniques, analyzing data using appropriate computer software, use up to date APA refereeing style, defending their thesis using multimedia and place finding where they could exactly be accessible to other students and concluded

that one has to recognize that computer technology is a facilitator of research knowledge, or a tool to assist individuals and groups in acquiring educational research knowledge. Yusuf (2005) find that ICT utilization in some selected universities, especially the use of computer, was for statistical analysis than on teaching. This implies that even though ICT utilization was found to have existed in universities, it has been of more benefit to other areas especially research than in teaching and learning situations in the classroom. Ololube (2005) reported that ICT has the potential to accelerate, enrich and deepen students' knowledge, motivate and engage students in research work. Consequently, the availability of ICT tools in the universities has greatly increased research knowledge among graduate students. Tinio (2009) maintained that online course materials, for example, may be accessed 24 hours a day, 7 days a week.

In a study on Internet technologies supporting research knowledge, Warner (2013) stated that Internet technologies enhance communication, information sharing and collaboration and present new and exciting approaches to research knowledge management. Internet environment is centered on user contributed content, with research knowledge being published, enriched, shared, communicated and combined on-line. Also, the Internet provides a new and efficient medium for conducting research; students can search for information about research knowledge through various Internet tools (by communicating with foreign students, lecturers, in other educational institutions; by using search engines; and by conducting online surveys). This source of information is promising because it is cost effective and quick. Jennex (2011) found that using the Internet as a common communications platform (either as an Intranet or an Extranet) and Web browsers as an interface is a viable, low cost solution. They found that Intranets not only supported distributed research knowledge processes but also enhanced users' abilities to research writing.

Research questions

1. To what extent does ICT availability influence research work performance of postgraduate students in terms of literature review, sampling, instrument reliability, computer application in data analysis, referencing format, report writing and overall research work performance?
2. To what extent does ICT utilization for research influence research work performance of postgraduate students in terms of literature review, sampling, instrument reliability, computer application in data analysis, referencing format, report writing and overall research work performance?.

Hypotheses

i. There is no significant influence of ICT availability for research on postgraduate students' research work performance.

ii. There is no significant influence of ICT utilization in research on postgraduate students' research work performance.

Methodology

The research design adopted in this study was ex-post facto research design. Ex-post facto design is considered the most appropriate design for this study because it enabled the researchers to concisely examine and probe into the already existing incidence or

phenomenon by trying to find out the effect from the cause which the researcher is already observing. The study area is the South- South geopolitical zone of Nigeria.

The researchers adopted stratified sampling techniques to select the sample for the study in three sampled universities. This technique is considered appropriate because of the nature of the target population which consists of the masters and doctorate students. The researchers personally administered the research questionnaire to the respondents. A sample size of 510 out of 24,230 post graduate students in federal universities in South – South geopolitical zone of Nigeria was used for the study.

The instrument used for data collection was structured questionnaire developed by the researchers tilted ICT Availability, Utilization and Research work Performance Questionnaire (ICTAURWPQ). The instrument is made up of three sections. Section 1 elicited information on the demographic data of the respondents such as gender, age and department; section 2 was 12 items used to gather information on level of availability and utilization; while Section 3 had 6 items in performance in research work. The instrument had four likert scale point response options ranging from Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD). Positive items were scored 4 -1 while negative items were scored 1 – 4 respectively. The instrument was validated by two measurement experts. The reliability range was between .80 - .91. This shows that the instrument is reliable for the study. The questionnaire was administered by the researchers in three sampled universities. The questionnaire administered was coded using a schedule.

a) For ICT availability:
   i) Sufficient available and functional = 19-24
   ii) Scantily available and functional =13-18
   iii) Available and not functional =7-12
   iv) Not available =1-6
b) ICT Utilization:
   i) Always = 17-24
   ii) Sometimes = 9=16
   iii) Never = 1=8

The data collected was analysed using One-way Analysis of Variance (ANOVA), and post hoc analysis was used where the result is significant

Presentation of results

Ho1: There is no significant influence of ICT availability for research on postgraduate students' research work performance.

The independent variable in this hypothesis is ICT availability for research, categorized into 4 groups as sufficiently available and functional, scantily available and functional, available and not functional and not available. The dependent variable had six and overall research work performance dimensions namely; literature review, calculation of sample size, calculating instrument's reliability, computer application in data analysis, referencing, report of findings and overall research work performance. The statistical

technique used for testing this hypothesis was one-way-analysis of variance (ANOVA). The results of the analysis are presented in tables 1 and 2.

Table 1: Summary of descriptive statistics for the post graduate students' research work performance based on ICT availability for research

S/N	research work performance	Groups (ICT availability for research)	n	$\bar{x}$	SD
1	Literature review	(1) Sufficiently available and functional	192	11.875	4.813
		(2) Scantily available and functional	166	13.404	4.557
		(3) Available and not functional	138	11.486	4.700
		(4) Not available	54	12.074	4.941
		Total	510	12.258	4.772
2	Calculating sample	(1) Sufficiently available and functional	192	12.307	4.968
		(2) Scantily available and functional	166	12.199	4.755
		(3) Available and not functional	138	11.377	4.306
		(4) Not available	54	11.241	5.065
		Total	510	11.936	4.763
3	Calculating instrument reliability	(1) Sufficiently available and functional	192	12.391	4.968
		(2) Scantily available and functional	166	12.488	5.064
		(3) Available and not functional	138	10.964	4.672
		(4) Not available	54	11.833	5.039
		Total	510	12.007	4.959
4	Use of computer in analysis	(1) Sufficiently available and functional	192	12.776	5.078
		(2) Scantily available and functional	166	13.416	4.858
		(3) Available and not functional	138	11.478	4.723
		(4) Not available	54	12.352	4.857
		Total	510	12.602	4.944
5	Referencing format	(1) Sufficiently available and functional	192	12.516	5.111
		(2) Scantily available and functional	166	12.958	5.066
		(3) Available and not functional	138	11.645	4.902
		(4) Not available	54	12.167	4.933
		Total	510	12.396	5.039

6	Report writing	(1) Sufficiently available and functional	192	12.292	5.233
		(2) Scantily available and functional	166	13.506	5.033
		(3) Available and not functional	138	12.058	5.120
		(4) Not available	54	11.963	5.248
		Total	510	12.567	5.171
7	Overall research work performance	(1) Sufficiently available and functional	192	112.328	38.039
		(2) Scantily available and functional	166	118.524	34.502
		(3) Available and not functional	138	106.290	30.758
		(4) Not available	54	109.166	36.220
		Total	510	112.372	35.294

Table 2: Analysis of variance for the influence of ICT availability for research on postgraduate students' research work performance

S/N	Research work performance	Sources of variance	SS	Df	MS	F-ratio	p-value
1	Literature review	Between Groups	330.206	3	110.069	4.938*	.002
		Within Groups	12171.133	506	22.291		
		Total	12501.338	509			
2	Calculation of population and sample size	Between Groups	107.187	3	35.729	1.580	.193
		Within Groups	12345.586	546	22.611		
		Total	12452.773	549			
3	Calculating instrument reliability	Between Groups	218.473	3	72.824	2.994*	.030
		Within Groups	13281.498	546	24.325		
		Total	13499.971	549			
4	computer application for data analysis	Between Groups	135.833	3	97.787	4.067*	.007
		Within Groups	13805.759	546	24.041		
		Total	13941.593	549			
5	Referencing format	Between Groups	293.360	3	45.278	1.791	.148
		Within Groups	13126.439	546	25.285		
		Total	13419.798	549			

6	Report writing	Between Groups	216.388	3	72.129	2.723*	.044
		Within Groups	14462.623	546	26.488		
		Total	14679.011	549			
7	Overall research work performance	Between Groups	11942.953	3	3980.98	3.235*	.022
		Within Groups	671911.638	546	1230.61		
		Total	683854.59	549			

*p< 0.05 (critical F-ratio of 2.61)

The result presented on table 2 shows that calculated F-ratio values of 4.938, 2.994, 4.067, 2.723 and overall value of 3.231 except, 1.580, 1.791, were each higher than the critical F-ratio of 2.61 at 0.05 level of significance with 3 and 506 degrees of freedom. The result implies that the F-ratio of literature review (4.938), calculation of instrument reliability (2.994), use of computer for data analysis (4.067) and overall (3.235) were each higher than critical f-ratio of 2.61 at .05 level of significance at 3 and 506 degrees of freedom, while calculation of population and sample size (1.580), reference format (1.791) were not significant.

This means that there a significant influence of ICT availability for research on literature review, calculation of instrument reliability, use of computer for data analysis, report writing and overall research work performance but no significant influence on calculation of population and sample size, and reference format. Since the overall F-ratio of 3.235 is higher than critical F-ratio of 2.61 at 0.05 level of significance with 3 and 546 degrees of freedom, the ICT availability for research exerts overall significant influence on postgraduate students' research work performance. This implies that there is a significant influence of ICT availability for research on postgraduate students' research work performance.

In order to clearly understand the pattern of the significant influence of ICT availability on research work performance, a Post Hoc multiple comparison was carried out using Fisher' LSD analysis technique. The result of the analysis is presented on table 3.

Table 3: Fisher's LSD multiple comparison analysis of the significance influence of ICT availability for research on postgraduate students research work performance

S/N	Research work performance	Groups (ICT availability for research)	Sufficiently available and functional	(2) Scantily available and functional	(3) Available and not functional	(4) Not available
1	Literature review skill	(1) Sufficiently available and functional	11.875 [a]	-1.529 [b]	.389 [b]	-.199 [b]
		(2) Scantily available	1.529 [c]	13.404 [a]	1.918 [b]	1.330 [b]

		and functional				
		(3) Available and not functional	.389 [c]	-1.918 [c]	11.486 [a]	-.589 [b]
		(4) Not available	.189 [c]	-1.330 [c]	.589 [c]	12.074 [a]
2	Instrumentation development skill	(MSW=22.29) (1) Sufficiently available and functional	12.307 [a]	.109 [b]	-.930 [b]	1.067 [b]
		(2) Scantily available and functional	-.109 [c]	12.199 [a]	.822 [b]	.958 [b]
		(3) Available and not functional	-.930 [c]	-.822 [c]	11.377 [a]	1.136 [b]
		(4) Not available	-1.067 [c]	-.589 [c]	-.136 [c]	11.241 [a]
3	Use statistical tools skill	(MSW=22.61) (1) Sufficiently available and functional	12.391 [a]	-.097 [b]	1.427 [b]	.557 [b]
		(2) Scantily available and functional	.097 [c]	12.488 [a]	1.524 [b]	.655 [b]
		(3) Available and not functional	-1.42 [c]	-1.524 [c]	10.964 [a]	-.870 [b]
		(4) Not available	-.557 [c]	-.655 [c]	.870 [c]	11.833 [a]
4	Computer application for data analysis	(MSW=24.32) (1) Sufficiently available and functional	12.776 [a]	-.640 [b]	1.298 [b]	.424 [b]
		(2) Scantily available and functional	.640 [c]	13.416 [a]	1.937 [b]	1.064 [b]

		(3) Available and not functional	-1.29 [c] 8	-1.937 [c]	11.478 [a]	-.874 [b]
		(4) Not available	-.424 [c]	-1.064 [c]	.874 [c]	12.342 [a]
			(MSW=24.04)			
5	Referencing skill	(1) Sufficiently available and functional	12.516 [a]	.442 [b]	.871 [b]	.349 [b]
		(2) Scantily available and functional	.442 [c]	12.958 [a]	1.313 [b]	.791 [b]
		(3) Available and not functional	-.871 [c]	-1.313 [c]	11.641 [a]	-522 [b]
		(4) Not available	-.349 [c]	-.791 [c]	.522 [c]	12.167 [a]
			(MSW=25.28)			
6	Reporting writing skill	(1) Sufficiently available and functional	12.292 [a]	-1.214 [b]	.234	.329 [b]
		(2) Scantily available and functional	1.214 [c]	13.506 [a]	1.448	1.543 [b]
		(3) Available and not functional	-.234 [c]	-1.448 [c]	12.068 [a]	.095 [b]
		(4) Not available	.329 [c]	-1.543 [c]	.095 [c]	11.63 [a]
			(MSW=26.488)			
7	Overall research work performance	(1) Sufficiently available and functional	26.488 [a]	-6.196 [b]	6.038 [b]	3.161 [b]
		(2) Scantily available and functional	6.196 [c]	118.524 [a]	12.234 [b]	9.357 [b]
		(3) Available and not functional	-6.038 [c]	-12.234*	106.290 [a]	-2.877 [b]

	(4) Not available	-3.161 [c]	-9357 [c]	2.877 [c]	109.167 [a]
		(MSW=1230.607)			

*P<.0.05 (critical t-value = 1.966)
a – Group means ($\bar{x}$) are along the diagonal.
b – Difference between the groups means ($\bar{x}$) are above the diagonal.
c – Fisher't-values are below the diagonal.

There is no significant pair-wise difference between categories of literature review, calculation of population and sample size, calculation of instrument reliability coefficient, use of computer for data analysis, referencing format and report writing but in the overall there is a negative pair-wise difference between available and non-functional versus available and functional (12.234).

Ho2: There is no significant influence of ICT utilization for research on postgraduate students' research work performance.

The independent variable of this hypothesis was ICT utilization, categorized into three groups as always, sometimes and never. The dependent variable was performance in research work categorized into six dimension namely; literature review, calculation of population and sampling size, calculation instrument reliability, computer application in data analysis, reference format, report writing. The statistical analysis technique deployed to test this hypothesis was One-Way-Analysis of Variance (ANOVA). The result of the analysis is presented in tables 4 and 5.

Table 4: Summary of descriptive statistics for the post graduate student research work performance based on ICT utilization

S/N	Research work performance	Groups (Research work performance)	n	$\bar{x}$	SD
1	Literature review	(1) Always	215	10.17	4.79
		(2) Sometime	114	11.99	3.99
		(3) Never	181	15.48	4.03
		Total	510	12.43	4.94
2	Calculation of population and sample size	(1) Always	215	12.42	5.32
		(2) Sometime	114	13.62	4.25
		(3) Never	181	17.02	5.11
		Total	510	14.29	5.42
3	Calculating instrument reliability coefficient	(1) Always	215	9.72	4.41
		(2) Sometime	114	11.95	3.11
		(3) Never	181	15.58	4.06
		Total	510	12.26	4.77
4	computer application for data analysis	(1) Always	215	7.21	2.49
		(2) Sometime	114	11.86	1.14
		(3) Never	181	17.68	1.40
		Total	510	11.89	4.96
5	Referencing format	(1) Always	215	8.65	3.85
		(2) Sometime	114	11.32	2.88
		(3) Never	181	16.38	2.90

		Total	510	11.94	4.76
6	Report writing	(1) Always	215	9.95	4.70
		(2) Sometime	114	11.38	3.90
		(3) Never	181	14.95	4.45
		Total	510	12.01	4.96
7	**Total**	(1) Always	215	89.19	29.68
		(2) Sometime	114	109.39	22.37
		(3) Never	181	142.84	24.22
		Total	510	112.37	35.29

Table 5: Analysis of Variance for the influence of post graduates students' ICT utilization for research on research work performance

S/N	Research work performance variables	Sources of variance	SS	Df	MS	F-ratio	p-value
1	Literature review	Between Groups	3002.574	2	1501.287	73.162*	.000
		Within Groups	10403.869	507	20.520		
		Total	13406.444	509			
2	Calculating sample	Between Groups	2300.639	2	1150.320	42.237*	.000
		Within Groups	13808.395	507	27.235		
		Total	16109.035	509			
3	Calculating instrument reliability	Between Groups	3635.673	2	1817.836	48.853*	.000
		Within Groups	18865.666	507	37.210		
		Total	12501.338	509			
4	Use of computer in datat analysis	Between Groups	11543.410	2	5771.705	133.108*	.000
		Within Groups	21984.044	507	43.361		
		Total	13741.454	509			
5	Referencing format	Between Groups	6359.552	2	3179.776	164.476*	.000
		Within Groups	6093.221	507	12.018		
		Total	12452.773	509			
6	Writing report	Between Groups	2695.922	2	1347.961	63.254*	.000
		Within Groups	10804.049	507	21.310		
		Total	13499.971	509			

7	overall	Between Groups	4916.956	2	2458.478	104.592*	.000
		Within Groups	11919.768	507	23.510		
		Total	16836.724	509			

*P>0.05; critical F-ratio = 3.00

The result in table 5 reveals that the six and overall research work performance in research work calculated F-ratios (73.162, 42.237, 48.853, 133.108, 164.476, 63.254 and 104.592) were each higher than the critical F-ratio of 3.00 at .05 level of significance with 2 and 507 degrees of freedom. The result implies that F-ratio of literature review (73.162), calculation of population and sample size (42.237), calculation of instrument reliability (48.853), computer application in data analysis (133.108), reference format (164.476), report writing (63.254) and overall components of knowledge (104.592) were each higher than the critical F-ratio of 3.00 at .05 level of significance with 2 and 507 degrees of freedom. This means that there is a significant influence of ICT utilization for research on postgraduate students' research work performance in terms of literature review, calculation of population and sample size, calculating instrument reliability, computer application in data analysis, referencing format, report writing and overall research work performance.

In order to clearly understand the pattern of the influence of ICT utilization on post graduate students' research work performance, a Post Hoc multiple comparison was carried out using Fisher's Least Significant difference (LSD) analysis. The result of the analysis is presented in table 6.

Table 6: Fisher's LSD multiple comparison analysis for the significant influence of ICT on postgraduate students' research work performance

S/N	Research work performance	ICT utilization	Never	Sometimes	Always
1	Literature review	Never	10.170[a]	-1.822[b]	-5.311[b]
		Sometimes	1.822[c]	11.992 [a]	-3.489[b]
		Always	5.311*	3.499*	15.482[a]
			(MSW=19.020)		
2	Calculation of population and sample size	Never	12.421[a]	-1.197[b]	-4.559[b]
		Sometimes	1.410[c]	13.621[a]	-3.399[b]
		Always	4.599*	3.354*	17.021[a]
			(MSW=25..244)		
3	Calculation of Instrument reliability coefficient	Never	9.719 [a]	-2.232[b]	-5.862[b]
		Sometimes	2.232*	11.952[a]	-3.629[b]
		Always	5.862*	3.629*	15.581[a]
			(MSW=16.208)		

4	computer application for data analysis	Never	7.209 [a]	-4.646[b]	-10.466[b]
		Sometimes	4.646*	11.865[a]	-5.821[b]
		Always	10.466*	5.821*	17.675[a]
			(MSW=3.627)		
5	Referencing format	Never	8.651 [a]	-2.683[b]	-7.731[b]
		Sometimes	2.683*	11.315[a]	-5.067[b]
		Always	7.731*	5.067*	16.382[a]
			(MSW=11.139)		
6	Report writing	Never	9.949[a]	-1.430[b]	-4.998[b]
		Sometimes	1.430[c]	11.379[a]	-3.569[b]
		Always	4.998*	3.569*	14.948[a]
			(MSW=19.751)		

*p< .05 (critical t = 1.96)
a – Group means ($\bar{x}$) are along the diagonal.
b – Difference between the groups means ($\bar{x}$) are above the diagonal.
c – Fisher's t-values are below the diagonal.

In respect of literature review, the result from the Fisher's LSD presented in table 6 shows that there is a significant pair-wise difference between post graduate students' ICT utilization always versus those with never (t=5.311) and those with always versus sometimes (t=3.499). There is, however, no significant pair-wise difference between sometimes versus always (t=1.822). The result from the mean scores shows that postgraduate students who utilized ICT for research only always ($\bar{x}$ = 15.483) perform better in their research work performance than those with sometimes ($\bar{x}$=11.992) and never (10.170). That is the more ICT utilization the more their research work performance in terms of literature review.

On the sub-variable of calculation of sample size, the result from the Fisher's LSD shows that there is a significant pair-wise difference between post graduate students ICT utilization always versus never (t=4.599) and those with always versus sometimes (t=3.354). There is, however no significant pair-wise difference between ICT utilization sometimes versus never (t=1.410). The result from the mean scores shows that post graduate students with much ICT utilization ($\bar{x}$= 15.48) performed better research work performance in terms of calculating sample size.

In the aspect of calculating instrument reliability coefficient, the result from the Fisher's LSD shows that there is a significant pair-wise difference between post graduate students' ICT utilization sometimes versus never (t=2.232), those with always versus never (t=5.862) and those with always versus sometimes (t=3.629). The result from the mean scores shows that post graduate students with much ICT utilization always ($\bar{x}$ =15.48) performed better in research work performance than sometimes ($\bar{x}$=11.952) and never ($\bar{x}$ =9.719) in terms of calculation of instrument reliability coefficient.

On the subvariable of computer application for data analysis, the result from the Fisher's LSD shows that there is a significant pair-wise difference between postgraduate students

ICT utilization always versus those with never (t=10.466), sometimes versus never (t=4.646) and always versus sometimes (t=5821). The result from the mean scores shows that postgraduate students with utilization ICT always ($\bar{x}$=17.675) performed better in research work performance than sometimes and never.

With respect to reference format, the result from the Fisher's LSD shows that there is a significant pair-wise difference between postgraduate students ICT utilization always versus those with never (t=7.731), sometimes versus never (t=2.651) and always versus sometimes (t=5.067). The result from the mean scores shows that it was postgraduate students with utilization ICT always ($\bar{x}$=16.382) that performed better in research work performance than sometimes ($\bar{x}$=11.315) and never (8.651).

On the sub-variable of report writing, the result from the Fisher's LSD shows that there is a significant pair-wise difference between postgraduate students who utilized ICT always versus never (t=4.998) and those who utilized always versus sometimes (t=3.569). There is, however no significant pair-wise difference between those who utilized ICT sometimes versus never (1.430). The result from the mean scores shows that postgraduate students who always utilized ICT for research ($\bar{x}$=14.948) performed better in research work in report writing than those who sometimes utilized ($\bar{x}$=11.379) and never ($\bar{x}$=9.949). That is, the more the frequent ICT utilization for research the better postgraduate students' research work performance in terms of report writing.

Discussion of the findings

The finding from hypothesis one revealed that there is a significant influence of ICT availability for research on postgraduate students' research work performance. This means that postgraduate research work performance is a function of the ICT availability for research. Therefore the more the ICT availability for research the more postgraduate students perform better in the research work. This finding confirms the finding of Akuegwu et al. (2011) who reported that ICT has the potential to accelerate, enrich and deepen students' knowledge, motivate and engage students in research work. Consequently, the availability of ICT tools in the universities has greatly increased research knowledge among graduate students. Tinio (2009) maintained that online course materials, for example, may be accessed 24 hours a day, 7 days a week. This explains why the finding revealed that universities where the ICT are available but not used for research will yield poor performance of students in research work.

The finding from hypotheses two revealed that there is a significant influence of ICT utilization for research on postgraduate students' research work performance. The ICT utilization will enhance research investigation and consequently productive outcome. This finding is in line with Ojini et al. (2017) who conducted a study on influence of ICT training for research on application of research skills among College of Education lecturers in Akwa Ibom and Cross River states of Nigeria. The result revealed that ICT training significantly influenced problem identification skill, question/hypothesis formulation skill, literature review skill, sampling technique skill, instrumentation development skill, use of statistical tools skill, computer application in data analysis, referencing skill, and report writing skill.

In the same line of agreement, Azuka (2011) remarked that Microsoft Excel provides good capabilities for doing statistical analyses. Postgraduate students of universities who do not acquire the knowledge and proficiency in the use of Microsoft Excel are likely to suffer because lack of research knowledge of this package is detrimental to students' competence in both learning and research knowledge.

Conclusion

ICT availability and utilization implies the presence and use of computer as well as other related ICT gadgets to improve research performance among postgraduate students. The consequences of lack of adequate ICT research facilities will result to poor research work performance. That is why in higher institutions in Nigeria, where e-libraries are not well-equipped or are practically not functional, post graduate students' research work performance is poor. On the other hand, universities where ICT is available and used for research, postgraduate students' research performance will meet the local and international standards.

Recommendations

1. The Federal Ministry of Education through National Universities Commission (NUC) should equip all universities, especially post graduate e-libraries, with functional ICT gadgets to facilitate research work among students.
2. All the universities in South-South geopolitical zone in particular and Nigeria at large should make computer course compulsory for all postgraduate students.

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