Promoting Multidisciplinary Research Collaborations at the Teacher Education Institutions in Delta State through Utilization of Digital Technologies (ICT)

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ABSTRACT

This study examined the importance of promoting multidisciplinary research collaborations at teacher education institutions (making special reference to colleges of education) in Delta State through utilization of ubiquitous digital technologies (in relation to the availability and usage of Information and Communication Technology – ICT, its roles in institutional research collaborations and challenges). Four research questions and three hypotheses guided the study. The study adopted the descriptive survey research design in order to collect data. A proportionate random sampling procedure was used in selection of 50% out of 628 academic staff from two teacher education institutions (Federal College of Education – Technical, Asaba and Agbor College of Education) in Delta State and the sample size for the study involved 314 academic teaching staff drawn from these Colleges of Education. A self-developed questionnaire titled: "Digital Technologies and Promoting Multidisciplinary Research Collaborations in Teacher Education Institutions Questionnaire", (DTPMRCTEIQ) containing 46 items and drawn on a 4-point scale was used to collect data for the study. Validity of the research instrument was carried out by two experts from the Department of Computer Education, Federal College of Education (Technical) Asaba, Delta State and one expert from the Department of Educational Management and Policy Nnamdi Azikiwe University, Awka, Anambra State. Reliability of the research instrument was established using the split half which yielded a coefficient value of 0.82 using the Pearson Product Moment Correlation Coefficient. Data was analyzed using simple percentages and pie-chart to represent data for research questions 1-2, while the mean score rated at 2.50 and standard deviation were used for representing data for research questions 3-4. The hypothetical results of the study revealed that there was significant difference between the observed and expected variables; and secondly, there was also significant relationship between the use of digital technologies and promotion of multidisciplinary research collaborations and development in teacher education. However, there were challenges hindering effective utilization of digital technologies at the teacher education institutions. From the findings of the study, recommendations were proffered and among others included: adequate funding/financing and provision of digital technologies/ICT facilities and equipment coupled with academic staff encouragement through continuous staff training and development on ICT application and usage.

Keywords*;* Multidisciplinary Research, Collaborations, Teacher Education, Institutions, Delta & Digital Technologies

1. INTRODUCTION

The role of digital technologies (ICTs) generally in the society at large cannot be over-emphasized. This has had great significance especially in such countries where it is greatly utilized and likewise contributed positively towards socio-economic, political, cultural, educational transformation and developments throughout the globe. It is widely acknowledged that digital technologies/ICT can be used to improve the quality of teaching and learning in any tertiary institution. Thierer (2000) pointed out that the role of digital technology in teaching and learning is rapidly becoming one of the most important and widely discussed issues in contemporary education policy. The prevalence and rapid development of digital technologies/information and communication technologies (ICTs) has transformed human society from the information technology age to the knowledge age. In fact, digital technologies are becoming natural part of man's daily life; thus their use in education by staff (academic and non-academic) and students is becoming a necessity (Galbreath, 2000). Thus, this study set out to critically appraise the role of digital technologies as a change agent for promoting multidisciplinary research collaborations in higher education in Nigeria.

Almala (2007) also expressed that many institutions of higher education, educational organizations, including the business community, and learners are embracing various digital technologies for a variety of reasons and needs. In both education and the school system most digital technologies processes and resources are highly been utilized. This also include use of computer hardware and software in education and training for storing data, supporting library and research e.g use of e-library, for training and classroom teaching and learning (Wikipedia, 2013).Wikipedia (2013) further highlighted that "ethical practice of facilitating learning and improving performance involves creating; using and managing appropriate technological processes and resources - which is the use of digital technologies". Supporting this, Almala (2007) pointed out that key factors such as flexibility, using mixed interactive multimedia, Internet research, archiving, electronic networks and telecommunications, can serve as a viable and qualitative learning alternative. Almala (2007) further argues that due to rapid changes in technological development and evolving e-learning instructional strategies, the related issues of accreditation, quality standards, educational research, policy issues, educational equity, assessment and evaluation, designing courses and programs, integrating curriculum and technology, student needs, and learning styles, needs to be re-examine to render and deliver e-learning courses of the highest quality.

Digital technologies which can also be referred to as the information and communication technologies (ICT) as defined by Yusuf and Onasanya (2004) are computer based tools used by people to work with the information and communication processing needs of an organization. It encompasses the computer hardware and software, the network and several other devices (video, audio, photography camera, etc.) that convert information (text), images, sound, motion and so on into common digital form (Milken Exchange on Education Technology, 1999). It is an eclectic application of computing, communication, telecommunication and satellite technology (Yusuf, 2000). Examples of these digital technologies as outlined by Thierer (2000), Yusuf and Onasanya (2004), Efe Özad and Kutoğlu (2010) includes: the use of computer assisted programmes, Internet, e-library/digital library, World Wide Web, chat programmes and friendship websites. It is important to consider how these electronic technologies differ and what characteristics make them important as vehicles for education (Berker, 1994). Digital technologies offer several opportunities in education. They could be highly effective not only in teaching/learning situations but also in multidisciplinary educational research and collaborations. Yusuf, M. O. and Onasanya, S. A. (2004) highlighted that firstly; they could be used as a means of preparing the current generation of students for future workplace that is, providing tools for tomorrow's practices. This is underscored in the foreword written by Lemke (1999) in the Milken Exchange on Education Technology commissioned report (1999). Lemke noted inter alia "Today's students live in a global knowledge based age, and they deserve teachers whose practice embraces the best that technology can bring to learning". Through teachers' use of technology (ICTs) students can be given the opportunities of becoming a part of the knowledge age and skills imparted to the young people in an increasingly complex world (Yusuf & Onasanya, 2004).

Secondly, digital technologies can make the school more efficient or more productive, engendering variety of tools to support and facilitate teacher's professional activities including research. Finally, digital technologies are seen as means to reform, research and innovate teaching, that is, to stimulate learners to learn actively and independently in a self directed way and/or in collaboration with others. It can be deduced that digital technologies/ICTs can be used to enhance research collaborations, learning and teaching within a university system (Yusuf & Onasanya, 2004). Digital technologies also play important role in multidisciplinary research promotion and collaborations. According to Yusuf and Onasanya (2004), research is a systematic attempt to find solutions to problem or question. It may be targeted at describing events, predicting events or controlling events (WAIER, 1991). Digital technologies can guide academic staff into new frontiers in basic and fundamental research. Specific areas of relevance of digital technologies to academic staff in the areas of research are enumerated below by Yusuf and Onasanya (2004).

Digital technologies with one another through e-mail, mail lists, newsgroups and chat rooms are resources that enable communication between scholars as they can post research, assignments book or journal lists references to on-line materials. Problems and solutions can be discussed between researchers and scholars can react to the work of others in an electronic manuscript (Yusuf & Onasanya, 2004). Digital technologies further provide greater opportunities for multidisciplinary research collaboration and networking among scholars spread throughout the world, thus national and international dimension of research issues can be studied as they can allow for communication with peers and experts around the world. Through collaborative knowledge building, studies can spotlight transnational trend analysis through human and instrumentation collaboration (Yusuf & Onasanya, 2004). Ng'etich (2003) further asserts that electronic publishing on the Internet has provided a greater opportunity for scholars and researchers to publish and present their ideas and research findings. Similarly, the Internet provides access to other scholarly contributions from different parts of the world for Nigerian researchers to scrutinize. It also provides the opportunity to recognize and access research and work produced by Nigerians, which may have in the past been ignored due to the information divide between developed and developing countries. Researches and scholars need the Internet for literature searches, but data can also be collected through this medium. Data can be processed and analyzed on the Internet and findings can be disseminated (Ng'etich, 2003).

In fact, digital technological (ICT) utilization is the major index of an academic staff quality and the determinant of advancement. Therefore, the use of digital technologies for promoting multidisciplinary research collaborations is very essential in education but in the Nigerian situation especially at the tertiary education level, observations show that this is either found wanting, lacking or inadequate for effective research collaborations and likewise in teaching/learning as a result of some factors and challenges hindering its effective utilization. Ng'etich (2003) highlighted that developing countries, particularly in Africa, have difficulty accessing materials due to financial limitations, over dependency on traditional ways of doing research, low access and connectivity, among other things. Nigerian researchers have continued to depend on traditional ways of doing research. This dependency on traditional methods is contributing to the low level of research output in Nigeria. In a study carried out by Etuk, Etudor-Eyo and Emah (2010) on improving research capabilities in the Third World countries for sustainable development, some of the findings revealed that problems associated with improving academic staff research capabilities is as a result of poor research methods, no collaborations between fellow tertiary institutions with research institutions and with overseas institutions, poor dissemination of research results, none harmonized database, lack of material resources and poor exchange of trained skilled and poor funding. This has also been the challenges hindering the utilization of digital technologies in promotion of multidisciplinary research collaborations.

Governments in most Third World countries have turned deaf ears to the mandate by the United Nations Educational, Cultural and Scientific Organization (UNESCO) (2000) that 26% of the annual budgets of national governments should be earmarked for education. In Nigeria, the annual budgetary allocations for education have consistently been below 10% of the national budget (Etuk, 2006). Educational funding has been a major bone of contention between the federal government of Nigeria and the Academic Staff Union of Universities (ASUU). This has led to the incessant strikes occasioned in the university system in Nigeria. The use of poor research method may also be consequent on the failure of institutions to collaborate and utilize resources for innovations (Etuk, Etudor-Eyo & Emah, 2010). People in the Third World countries are naturally more organic and interdependent. One would have thought that this kind of relationship would be carried into academic research. Failure to collaborate may arise from ignorance of the fact that collaborative researches are far more rewarding than not (Etuk, Etudor-Eyo & Emah, 2010). Thus, have availed the need to create innovations and knowledge transfer within the Nigerian tertiary education system through technological transfer; using digital technologies - ICTs. However, the present study promotes a need for shared vision and an institution-wide response, consultation and collaboration, a commitment to a "futures" perspective, a culture of "openness" and a willingness to embrace elements of risk through multidisciplinary institutional research collaborations as being significant to an institution in shaping its future direction, just as highlighted by Reushle (2010).

1.1 Statement of the Problem
Rapid changes in the nature of the workplace, work itself, the structure of organizations and the pervasive presence of networked digital technologies are requiring a shift in focus in the world of education, teaching/learning, training and research (Reushle, 2010). In today's knowledge economy, the role of higher education is being redefined and using digital technology (whose effective utilization is one of greatest challenges facing the Nigerian education sector) in innovative ways can be at the heart of institutional change that fosters development. Nget'ch (2003) notes that, "the socio-economic and technological changes ushered in by globalization demand that researchers devise new ways of addressing emerging research challenges". The Internet for instance has introduced new form of learning material in which the dispersal of knowledge becomes easy, quick, and with minimal cost.

According to Yusuf (2000), lecturers in tertiary institutions, particularly in the various university systems are involved basically in two things: teaching and research, with auxiliary administrative assignments. Digital technologies (ICTs) have the potentials of not only ensuring effectiveness and efficiency in these two areas (teaching and learning); they have the potentials of promoting multidisciplinary research collaborations for both institutional and society's development. Supporting the above, Obiri-Yeboah, Fosu and Kyere-Djan (2013) highlighted that the proliferation of technology has complicated the teaching, research and learning process and finding the best ways of adopting technology into teaching and research is one of the challenges the 21st century teachers face. Research studies in the past decade have shown that digital technologies (ICT) is an effective means for widening educational opportunities, but most lecturers and students do not use it as a method in lecturing nor in their teaching and learning (Obiri-Yeboah, Fosu and Kyere-Djan, 2013). According to Yusuf and Onasanya (2004) digital technologies involves the use of telecommunications, designed to facilitate students' learning through e-mail, interactive web sites and two-way audio/video teleconferencing. In spite of digital technology (ICT) recognized potentials; their integration in research and teaching - learning process will be dependent on its availability, adequacy through funding, material provision and constant maintenance/repair, teachers' knowledge/competence, exposure and willingness/readiness to integrate them in their research for teaching effectiveness. Learning and teaching contexts, such as discipline areas, sizes of classes, facilities and resources, lack of prestige or rewards for innovative teaching all contribute to the circumstances that influence an institution's ability or willingness to embrace this innovation into multidisciplinary research collaborations (Reushle, 2010).

Digital technology likewise known as Information and Communication Technology (ICT) should be used as a pedagogically powerful tool for the construction, multidisciplinary research collaborations and modeling of knowledge. However, as noted in a recent EDUCAUSE white paper (EDUCAUSE, 2010), creation of a future that meets diverse educational expectations requires "collaboration across organizational and national boundaries, bringing together the collective intelligence of people from backgrounds including education, corporations, and government". With effective promotion of multidisciplinary research collaborations through the use of digital technologies in the higher education system especially teacher education will lead towards provision quality products for the labour market and achievement high standards, quality and degree of excellences in the teaching/learning in the institutions whose outcome is the key to sustainable development in the society – in such areas like economic development, peace, security and environmental sustainability. Lecturers will need to use ICTs in order to equip tomorrow's employees and customers with the requisite competence and knowledge to use digital technologies/ICTs within their work (Davis & Tearle, 1999). Therefore, the present study promotes the need for promoting multidisciplinary research collaborations at teacher education institutions in Delta State through utilization of digital technologies (ICT), which is the problem of this study.

2. PURPOSE OF THE STUDY

The study has the overall objective of examining the importance of promoting multidisciplinary research collaborations at teacher education institutions in Delta State through utilization of digital technologies - Information and Communication Technology (ICT). Specifically, the study seeks to determine:
1. The availability of digital technological kits/ICT facilities for promoting multidisciplinary research collaborations at teacher education institutions in Delta State.
2. To determine academic staff exposure and usage of digital technology (ICTs) in research and teaching at teacher education institutions in Delta State.
3. The role of digital technologies (ICTs) in promoting multidisciplinary research collaborations at teacher education institutions in Delta State.
4. Factors challenging effective utilization of digital technologies (ICTs) at teacher education institutions in Delta State.

2.1 Research Questions

The study was guided by the following research questions:
1. To what extent are digital technological kits/ICT facilities available for promoting multidisciplinary research collaborations at teacher education institutions in Delta State?
2. To what extent are academic staff exposed to and effectively use digital technologies (ICTs) in their research and teaching at teacher education institutions in Delta State?
3. How far does the use of digital technologies (ICTs) promote multidisciplinary research collaborations at teacher education institutions in Delta State?
4. What factors challenged effective utilization of digital technologies (ICTs) at teacher education institutions in Delta State?

2.2 Hypotheses

The following null hypotheses guided the study:

H0$_1$: There is no significant difference towards the extent to which digital technological kits/ICT facilities are available for promoting mutlidisciplinary research collaborations at teacher education institutions in Delta State.

H0$_2$: There is no significant difference towards the extent to which academic staffs are exposed to and effectively use digital technologies (ICTs) in their research and teaching at teacher education institutions in Delta State.

H0$_3$: There is no significant relationship between the use of digital technologies (ICTs) and promotion of multidisciplinary research collaborations at teacher education institutions in Delta State.

3. METHODOLOGY

3.1 Design of the Study:

The descriptive survey design was adopted for the study, which sought to collect data on the opinions of the participants (academic staff) with a view to examine the importance of promoting interdisciplinary research collaborations at teacher education institutions in Delta State through utilization of digital technologies - Information and Communication Technology (ICT). This design was employed in order to conduct a field survey and gather data from teachers (participants).

3.1 Population and Sample Size:

The study population consisted of all the academic staff within the teacher education institutions - i.e colleges of education in Delta State, which comprised 628 academic staff. The sample for this study was made up of 314 academic staff selected out of 628 within two colleges of education in Delta State(Federal College of Education – Technical, Asaba having 348 academic staff and Agbor College of Education having 280 academic staff), through a proportionate random sampling technique. The samples were selected at 50% from the entire population of the study in Delta State.

3.2 Instrumentation:

The main instrument used for conducting the study is a questionnaire personally developed by the researchers which contained 46 items and designed on a 4-point scale of Highly/Sufficiently Available – (HSA), Moderately Available (MA), Scarcely/Rarely Available (SRA) and Not Available (NA) for the responses of research question 1; while Highly Exposed and Utilized – (HEU), Moderately Exposed and Utilized – (MEU), Rarely Exposed and Utilized – (REU) and Not Exposed and Utilized – (NEU) was used for responses in research question 2; and Strongly Agree – SA (4), Agree – A (3), Disagree – D (2), Strongly Disagree – SD (1) for the responses of research questions 3 and 4. The research instrument titled: "Digital Technologies and Promoting Multidisciplinary Research Collaborations in Teacher Education Institutions Questionnaire", (DTPMRCTEIQ), formed the basis for the primary data and was equally used by the researchers to collect data. The research instrument was validated by two experts from the Department of Computer Education, Federal College of Education (Technical) Asaba, Delta State and one expert from the Department of Educational Management and Policy Nnamdi Azikiwe University, Awka, Anambra State to establish the face and content validity in line with the purpose of the study.

The corrections and modifications made by the experts on the instrument to ensure its validity were incorporated in the final correction of the instrument. Reliability of the research instrument was established by conducting a pilot-test using 20 academic staff of two colleges of education in Anambra State and thereafter data was collated using the split half method and was found to have a reliability coefficient 'r' value of 0.82 using the Pearson Product Moment Correlation Coefficient measurement to appraise the reliability, trustworthiness and dependability of research instrument. This affirms that the instrument was reliable for the study. Data was analyzed using simple percentages and pie-chart to represent data for research questions 1-2, while the mean score rated at 2.50 and standard deviation were used for analyzing data for research questions 3-4. Any mean that rated above the bench mark of 2.50 was regarded as agree while mean rated below the bench mark (2.50) was regarded as disagree. The research instrument was finally administered and collected by the researchers and two trained research assistants on a personal, hand delivery and face to face contact with all the participants.

4. RESULTS

Table 1: *Percentage score of academic staff responses on the extent to which digital technological kits/ICT facilities are available for promoting multidisciplinary research collaborations at teacher education institutions in Delta State*
N = 314

S/N	ITEMS	HSA	MA	SRA	NA
1	Local Area Network – LAN, VSAT and Satellite Connectivity	(5) 1.59%	(6) 1.91%	(95) 30.26%	(208) 66.24%
2	e-library/digital library and reserves	(0) 0	(0) 0	(109) 34.71%	(205) 65.29%
3	Well equipped computer lab	(11) 3.50%	(34) 10.83%	(196) 62.42%	(73) 23.25%
4	Personal Computers	(135) 43%	(107) 34.10%	(40) 12.74%	(31) 9.87%
5	Internet service provider and social networking	(25) 7.96%	(18) 5.73%	(199) 63.38%	(72) 22.93%
6	Smart phones and Ipads	(85) 27.10%	(110) 35.03%	(75) 23.90%	(44) 14.01%
7	Standby Generator	(135) 43%	(126) 40.13%	(25) 7.96%	(28) 8.92%
8	Printers and Scanners	(190) 60.51%	(95) 30.26%	(19) 6.10%	(10) 3.20%
9	Photographic materials e.g projectors, videos	(25) 7.96%	(66) 21.01%	(95) 30.26%	(128) 40.76%
10	e-blackboard e.g Google blackboard	(0) 0	(0) 0	(250) 79.62%	(64) 20.38
	TOTAL	**19.46%**	**17.9%**	**35.14%**	**27.49%**

Table 1 results showed that the percentage of academic staff response on the extent to which digital technological kits/facilities available for promoting multidisciplinary research collaborations at the teacher education institutions in Delta State ranged from 19.46% for those responses on highly and sufficiently available; 17.9% for moderately available; 35.14% for scarcely and rarely available; and 27.4% for not available. This result indicates that digital technological kits/facilities for promoting multidisciplinary research collaborations were not readily available at the teacher education institutions. This is further represented on a pie-chart below.
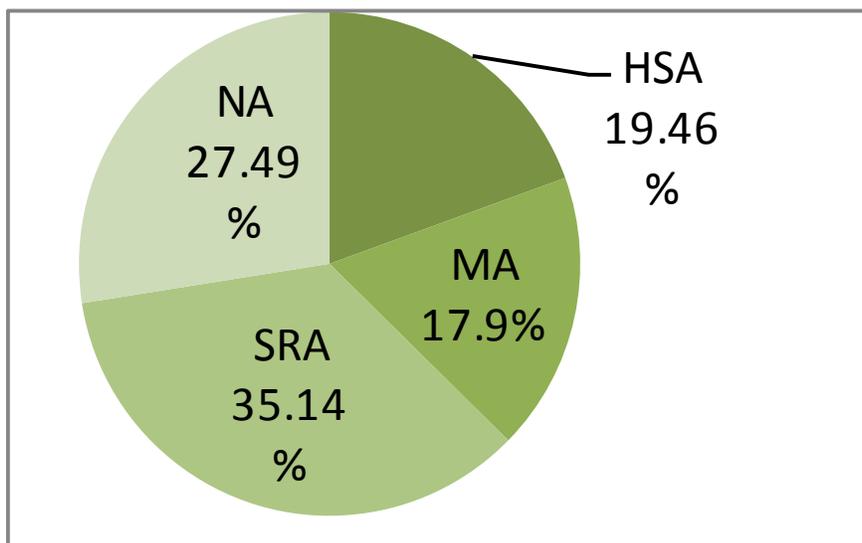

Figure 1: Pie-Chart on Academic Staff responses on the extent to which Digital Technological Kits/ICT Facilities were available for Promoting Interdisciplinary Research Collaborations at Teacher Education Institutions in Delta State

Table 2: Percentage score of academic staff responses on the extent to which academic staff are exposed to and effectively use digital technologies (ICTs) in their research and teaching at teacher education institutions in Delta State

N = 314

S/N	ITEMS	HEU	MEU	REU	NEU
11	Internet research and browsing	(69) 21.80%	(109) 35%	(112) 35.70%	(24) 7.64%
12	On-line collaborations, interactive chat programmes and multimedia	(32) 10.20%	(49) 16%	(152) 48.41%	(81) 25.80%
13	e-mail and facebook	(124) 39.50%	(168) 54%	(12) 3.82%	(10) 3.20%
14	Video conferencing and live broadcast e.g Google hangout, WebEx, Skype	(0) 0	(0) 0	(163) 51.91%	(151) 48.10%
15	On-line professional and discussion groups e.g LinkedIn	(30) 9.60%	(20) 6.40%	(164) 52.23%	(100) 31.85%
16	Computer-based statistical packages and analysis i.e SPSS	(55) 17.5%	(88) 28.03%	(91) 29%	(80) 25.48
17	Use of electronic manuscript and e-book	(25) 8%	(75) 24%	(100) 32%	(114) 36.31%
18	Word processor, power point and spread sheet	(62) 19.80%	(103) 33%	(123) 39.20%	(26) 8.28%
19	Electronic publishing	(53) 17%	(44) 14.01%	(167) 53.20%	(50) 16%
20	Use of smart phones and Ipads	(107) 34.10%	(168) 54%	(19) 6.05%	(20) 6.40%
21	Distributed multimedia curriculum online	(0) 0	(0) 0	(151) 48.10%	(163) 52%
	TOTAL	**16.14%**	**24.04%**	**36.32%**	**23.73**

Table 2 showed results of the percentage of academic staff response on the extent to which academic staff are exposed to and effectively use digital technologies (ICTs) in their research and teaching at teacher education institutions in Delta State and this ranged from 16.14% representing of those responding to highly exposed and utilized; 24.04% of moderately exposed and utilized; 36.32% representing rarely exposed and utilized; and 23.73% showing not exposed and utilized. This indicates that the academic staffs rarely not exposed to effective usage of digital technologies (ICTs) in their research and teachings at teacher education institutions in Delta State and this could further be represented using a pie-chart below.
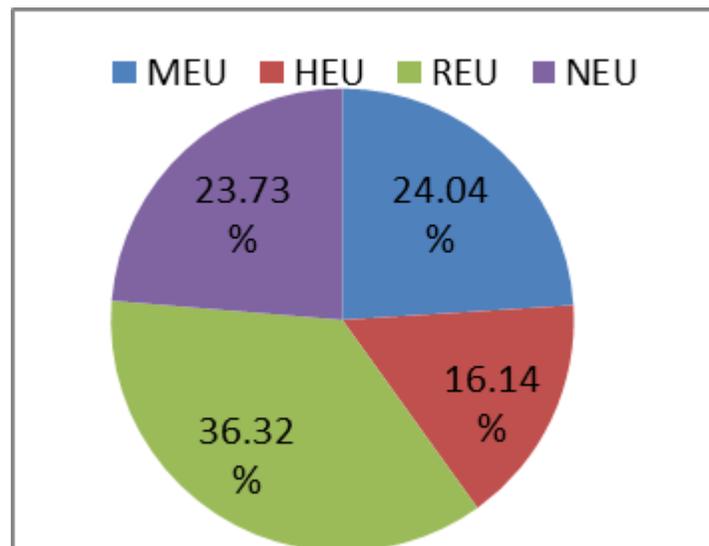

Figure 2: Pie-Chart on Academic Staff responses on the extent to which the extent to which Academic Staff are exposed to and effectively use Digital Technologies (ICTs) in their Research and Teaching at Teacher Education Institutions in Delta State

Table 3: Mean score and standard deviation of academic staff responses on how far the use of digital technologies (ICTs) promoted multidisciplinary research collaborations at teacher education institutions in Delta State

N = 314

S/N	ITEMS	SA	A	D	SD	MEAN (X)	STD. DEV	DECISION
22	For exchange of information and ideas among colleagues and researchers at different places through collaborations and communication	137	150	22	5	3.33	0.68	Agree
23	For electronic and digital resource sharing and exchange of research materials in various multidiscipline	103	122	61	28	2.96	0.94	Agree
24	Provides the means of circumventing most of the constraints to academic freedom i.e pays no attention to geographical boundaries	133	115	44	22	3.14	0.91	Agree
25	Provides opportunities for current literature searches, data collection and e-books and journals in multidiscipline	136	153	12	3	3.31	0.73	Agree
26	Research ideas and findings can be easily be disseminated and published on-line to various multidiscipline	188	112	10	4	3.54	0.64	Agree
27	Provides access to social networking and communication	124	113	33	44	3.01	1.03	Agree
28	Delays and increases difficulties in multidisciplinary research information search	22	16	121	155	1.70	0.86	Disagree
29	Provides ready means for presentation and storing research reports in various multidiscipline	122	154	14	24	3.19	0.84	Agree
30	Could be used for mathematical and statistical calculations and analysis/manipulations	131	129	21	33	3.14	0.94	Agree
31	Provides on-line linkages that makes it easy for various researchers to communicate at the same time	155	135	15	9	3.39	0.71	Agree
	Section Mean and Standard Deviation				=	**3.07**	**0.97**	

Results from the responses of the academic staff in Table 3 indicated that all the participants responded positively to the all statements in items 22-27 and 29-31 showing strong positive agreement with the statements which was above the mean bench mark of 2.50. Except for item 28 in which participants responded negatively in strong disagreement with the statement and also scored below the mean bench mark of 2.50.

Table 4: *Mean score and standard deviation of academic staff responses on the factors that challenged effective utilization of digital technologies (ICTs) at teacher education institutions in Delta State*
N = 314

S/N	ITEMS	SA	A	D	SD	MEAN (X)	STD. DEV	DECISION
32	Poor funding	180	101	16	17	3.41	0.82	Agree
33	Inadequate digital technological kits and equipment	121	160	13	20	3.22	0.80	Agree
34	Poor digital inter-connectivity satellite and accessibility	140	156	10	8	3.36	0.67	Agree
35	Lack of academic staff readiness and interest	32	50	118	114	2.00	0.69	Disagree
36	Lack of academic staff exposure to use of digital facilities	145	106	36	27	3.18	0.94	Agree
37	Constant electricity eruption	165	133	5	11	3.44	0.70	Agree
38	Inadequate space for the building of LAN and Satellite	58	69	88	99	2.27	1.09	Agree
39	Inadequate/poor maintenance of the existing digital technological kits	105	113	52	44	2.89	1.02	Agree
40	Inadequate staff training and development in the use of digital technological kits	156	119	22	17	3.32	0.93	Agree
41	Limited time for staff research collaborations	37	19	154	104	1.96	0.93	Disagree
42	Lack of incentives for staff to purchase most of the gadgets	125	120	24	45	3.04	1.02	Agree
43	Fear and anxiety over the use of digital technologies	22	35	142	115	1.89	0.86	Disagree
44	Government failure to implement the ICT policy in education and school system	159	126	18	11	3.38	0.75	Agree
45	Over dependency on traditional research methods	136	157	14	7	3.34	0.67	Agree
46	High cost of running generators	156	118	19	21	3.30	0.86	Agree
	Section Mean and Standard Deviation =					2.93	1.04	

Results from the responses of the academic staff in Table 4 indicated that all the participants responded positively to the all statements in items 32-34, 36- 40, 42 and 44-46 showing strong positive agreement with the statement which was above the mean bench mark of 2.50. Except for item 35, 41 and 43 in which participants responded negatively in strong disagreement with the statement and also scored below the mean bench mark of 2.50.

Table 5: Chi-square (X^2) analysis on no significant difference towards the extent to which digital technological kits/ICT facilities are available for promoting interdisciplinary research collaborations at teacher education institutions in Delta State

N0.	df	Significance level	X^2 calculated	X^2 critical	Decision
314	5	0.05	179.28	11.07	Reject H_0

The X^2 calculated value of 179.28 is greater than the X^2 critical value of 11.07 at 0.05 level of significance with a degree of freedom of 5, the null hypothesis which stated that there is no significant difference towards the extent to which digital technological kits/ICT facilities are available for promoting multidisciplinary research collaborations at teacher education institutions is rejected while the alternative hypothesis H_0 is accepted.

Table 6: *Chi-square (X^2)analysis on no significant difference towards the extent to which academic staffs are exposed to and effectively use digital technologies (ICTs) in their research and teaching at teacher education institutions in Delta State*

N0.	df	Significance level	X^2 calculated	X^2 critical	Decision
314	5	0.05	310.18	11.07	Reject H_0

The X^2 calculated value of 310.18 is greater than the X^2 critical value of 11.07 at 0.05 level of significance with a degree of freedom of 5, the null hypothesis which stated that there is no significant difference towards the extent to which academic staffs are exposed to and effectively use digital technologies (ICTs) in their research and teaching at teacher education institutions is rejected while the alternative hypothesis H_0 is accepted.

Table 7: *Analysis of the relationship/correlation ('r') between the use of digital technologies (ICTs) and promotion of interdisciplinary research collaborations at teacher education institutions in Delta State* (N = 10).

Variables	($\bar{X}$)	'r'	Result
Use of Digital Technologies (ICTs)	16.28		
		1.780	H_0 null hypothesis is rejected and H_a alternative hypothesis accepted.
Promotion of Multidisciplinary Research Collaborations	14.43		

Significance at 0.05 level.   .

From table 7, the calculated 'r'-value of 1.780 is greater than (>) the critical table r-value of 0.878 required for significance at 0.05 level ('r' >0.05). This means that there is a significant positive relationship between the use of digital technologies (ICTs) and promotion of multidisciplinary research collaborations at teacher education institutions. The strength of the association is very strong because the value 1.780 is a whole number which indicates a perfect positive relationship between the two distributions. The obtained value of 'r' shows that effective utilization of digital technologies would promote high multidisciplinary research collaborations especially in teacher education institutions. Therefore, the null hypothesis which states that there is no significant relationship between the use of digital technologies (ICTs) and promotion of multidisciplinary research collaborations at teacher education institutions in Delta State is rejected at the level of 0.05 alpha level; while the alternative hypothesis that there is significant positive relationship is accepted.

5. DISCUSSIONS

The findings of this study generally reveal that the use digital technologies (ICTs) would definitely and effectively promote multidisciplinary research collaborations and innovations at the teacher education institutions not only in Delta State but throughout the entire tertiary institutions in the Nigerian federation. This is possible only when they are adequately and sufficiently provided in the institutions through financial support, and others; and likewise if academic staff are highly exposed to utilize them in promoting multidisciplinary research collaborations and innovations. However, the current scenario at the teacher education institutions as revealed by the finding of this study indicates that such is not obtainable in the institutions as a result of some challenges. Digital technological kits are also found wanting, lacking or inadequate at the institutions.

On the other hand, majority of the academic staff are not exposed to utilization of this sort of technology (ICT) in research. The findings of the study in Table 1 from research question 1 revealed that digital technological kits/facilities for promoting multidisciplinary research collaborations were not readily available at the teacher education institutions. Such digital technological kits and facilities that would have promoted multidisciplinary research collaborations were lacking and missing at the institutions. This includes facilities/resources like LAN, VSAT, satellite connectivity, digital library, e-library, well equipped computer lab, photographic materials like projectors, film strips and slides, videos, etc including Internet service provider and social networking were all found lacking and wanting in the institutions. Although, most of the academic staff had their personal computers, Ipad and smart phones, such did not promote research collaborations that led to innovations.

Printers and scanners and standby generators were found adequately available in the institutions for only official matters usage. This finding deters and dissuades from the statements of Reushle (2010) who also pointed out that the internet, social networks, and collaborative online tools which allow people to work together more easily/collaboratively and the provision of open access to content can be both the cause of change for universities, and a tool with which they can respond. This could only be possible through its adequacy, provision and availability in the universities (Reushle, 2010). To Marshall (2000), various technologies deliver different kinds of content and serve different purposes in the classroom. Word processing and e-mail promote communication skills; database and spreadsheet programmes promote organizational skills; and modelling software promotes the understanding of Science and Mathematics concepts.

According to Yusuf and Onasanya (2004) digital technology as a tool involves the use of a large array of hardware and software: word processors, graphic packages; digital camera, presentation applications, databases, and spreadsheet, among others. These hardware and software do not have limited educational purpose, but they are designed to help people extend their abilities to do work (Yusuf & Onasanya, 2004). The findings of Table 2 showed the extent to which academic staff are exposed to and effectively use digital technologies (ICTs) in their research and teaching at teacher education institutions.

The results of the findings revealed that academic staffs in the teacher education institutions are rarely exposed to effective usage of digital technologies (ICTs) in their research and teachings. Academic staff rarely utilizes such digital technological services such as: Internet research and browsing, on-line collaborations, interactive chat programmes and multimedia, video conferencing and live broadcast e.g Skype, WebEx, on-line professional and discussion groups e.g LinkedIn, use of electronic manuscript and e-book, electronic publishing, distributed multimedia curriculum online, computer-based statistical and mathematical packages e.g SPSS and word processors, power point and spread sheets. Majority of the academic staff were highly exposed to only the utilization of smart phones and Ipads showing that they lacked the skill to effectively utilize digital technological services in their research and teaching which could be a major hindrance towards promoting interdisciplinary research collaborations at the teacher education institutions.

The finding agrees with the statements of Obiri-Yeboah, Fosu and Kyere-Djan (2013) who pointed out previously in the study that the proliferation of technology has complicated the teaching, research and learning process and finding the best ways of adopting technology into teaching and research is one of the challenges the 21st century teachers face. Research studies in the past decade have shown that digital technologies (ICT) is an effective means for widening educational opportunities, but most lecturers and students do not use it as a method in lecturing nor in their teaching and learning (Obiri-Yeboah, Fosu and Kyere-Djan, 2013). According to Adeya and Oyeyinka (2002) the level of access and connectivity is far below that of developed countries. For instance, Nigeria as a whole has only two percent of the Internet connectivity in the developed world.

Table 3 further identified the academic staff responses on how far the use of digital technologies (ICTs) promoted multidisciplinary research collaborations at teacher education institutions. This includes that the use of digital technology at teacher education institutions had the following potentials and benefits: for exchange of information and ideas among colleagues and researchers at different places through collaborations and communication; for electronic and digital resource sharing and exchange of research materials; provides the means of circumventing most of the constraints to academic freedom i.e pays no attention to geographical boundaries; provides opportunities for current literature searches in various multidiscipline, data collection and e-books and journals; research ideas and findings can be easily be disseminated and published on-line in various multidiscipline; provides multidisciplinary access to social networking and communication; it is fast and reduces difficulties in research information search in various multidiscipline, provides ready means for presentation and storing research reports; could be used for mathematical and statistical calculations and analysis/manipulations; and provides on-line linkages that makes it easy for various researchers to communicate at the same time in various multidiscipline.

This is in line with the statements of Kamba (2008) who posits that digital technologies through the use on Internet has the following great potentials for researchers: aids increasing access to information; it is the fastest way of disseminating research ideas, information and findings; provides access to virtual library, e-book, data publishing and social networking; serves as a medium of communication and collaborations for researchers; and enables researchers consult more and current information resources. Digital technologies can facilitate research in any discipline as they provide quicker and easier access to more extensive and current information through digital libraries that provide digitized full-text resources to learners and researchers. Others are the electronic list - a directory of scholarly and professional e-conferences containing relevant topics and articles relevant to researchers, and electronic reference desks or virtual libraries. Others include electronic journal and catalogues and image database. Other Internet resources, gopher and CD-ROM can provide a researcher with current, in depth, firsthand information (Yusuf & Onasanya, 2004). Digital technologies can be used to do complex mathematical and statistical calculations which are important in research.

They can be used for data manipulation and analysis. The digital technologies (ICTs) will facilitate the completion of data on time, performance of statistical analysis. In fact, complex statistical analyses are not only performed instantaneously but also more accurately than possible manually (Yusuf & Onasanya, 2004). Digital technologies also provide researchers with 'Ready Avenue' for the dissemination of research reports and findings. Publication outlets include e-books, e-journals or through personal web-sites. They provide ready means for production of research reports. Furthermore, digital video, audio, software simulation, synchronous and asynchronous chats and interactive software, among others, bring dynamism in describing a method or reporting result (Middleton, 2000). According to Thierer (2000), experts in the fields of education have agreed that, if digital technologies (ICT) are properly used, it holds great promise to improve research, teaching and learning in addition to shaping work-force opportunities. The value of digital technologies cannot be over-emphasized in creating innovations, research design, collaborations and implementation of experimental and descriptive studies, statistical analysis, data production and storage, and dissemination of research information (Thierer, 2000).

The findings in Table 4 revealed the factors that challenged effective utilization of digital technologies (ICTs) at teacher education institutions in Delta State. These include: poor funding; inadequate digital technological kits and equipment; poor digital inter-connectivity satellite and accessibility; lack of academic staff exposure to use of digital facilities; constant electricity eruption; inadequate space for the building of LAN and Satellite; inadequate/poor maintenance of the existing digital technological kits; inadequate staff training and development in the use of digital technological kits; lack of incentives for staff to purchase most of the gadgets; government failure to implement the ICT policy in education and school system; over dependency on traditional research methods; and high cost of running generators. It was also found out in the study that academic staff readiness and interest, time factor (limited time) coupled with fear and anxiety over the use of digital technologies, were not among the factors that challenged effective utilization of digital technologies (ICTs). Obiri-Yeboah, Fosu and Kyere-Djan (2013) identified the challenges of utilizing digital technologies as: inadequate digital technological infrastructure in terms of human ware and facilities: which ideally servers need to be change every three years, but some of our servers are about 8 years which does not help our operations; inadequate staff to attend to users' needs, support and train them; inadequate computers for staff - (when you take the ratio of staff to compute, it is far below average). Time for staff to use the lab is not adequate:

There should be 24/7 ICT services but it accessibility is not adequate; interrupted power supply: atimes there is power fluctuation which affect our activities, though we have standby power supply, it is very expensive to use it. From the data and observation, there are a lot challenges that prevent the institutions to increase ICT infrastructure. As indicated, management support is low, people attitude/readiness towards ICT utilization is low and the desire to use it is also low. The building/space is not available. This also makes their activities challenging (Obiri-Yeboah, Fosu and Kyere-Djan, 2013). Kadzera (2006) also opined that such factors like training (pre-service & in-service), availability, support and access (acting as barriers) highly contributed to the use of digital technologies. In addition to training, adequate supplies, support from administrators and peers, and access to digital technologies, which influence the use of digital technologies, there can also be other barriers that impede the use of technologies and such include lack of preparation time and lack of incentives. Similarly, where the technologies are available, but, if the tutors/teachers do not know how to use them, then learning that could have been enhanced by the use of the technologies will not occur. There is need for staff training and constant retraining in the use of these technologies (Kadzera, 2006).

The hypothetical results of the study revealed that there was significant difference between the observed and expected variables. However, this indicated that it was expected that academic staff in the teacher education institutions were adequately supported and exposed to utilize the digital technological kits for promoting multidisciplinary research collaborations but from the current situation of what was observed, such practice was not obtainable. Secondly, there was also significant positive relationship between the use of digital technologies and promotion of multidisciplinary research collaborations and development in teacher education. This shows that effective utilization of digital technologies would also promote both multidisciplinary and interdisciplinary research collaborations and innovations at the teacher education institutions when utilized for such purposes.

6. CONCLUSION

Certainly, the present and future academic global community will need to continually utilize digital technologies channeled/focused towards a high degree. This has made it imperative that academic staff not only need to use digital technologies/ICTs, but they need to become comfortable with using and applying it in the areas of promoting multidisciplinary educational research collaborations and innovations in order to enable them improve their instructional delivery, participate fully in the life of the contemporary higher education and accomplish their everyday task that enhances them to produce competent individuals for sustainable economic development, peace and security in the Nigeria society, as highlighted by Galbreath (2000) and which has thus necessitated the study. Therefore, based on the findings of the study, the following recommendations have been proffered below.

7. RECOMMENDATIONS

1. Multidisciplinary research collaborations and developments should highly be encouraged/ promoted in the teacher education institutions through utilization of digital technologies. Of course, its effective utilization must be supported through adequate financial support and funding from both the government and other stakeholders; likewise adequate provision of digital technologies/ICT facilities and equipment.
2. Academic staff should be encouraged through continuous staff training and development on ICT application and usage for research collaborations. This should also be accorded by providing adequate incentives for academic staff.
3. Government must make efforts by adopting effective strategies, measures and modalities to ensure that the current ICT policy is effectively implemented at the teacher education institution in order to promote multidisciplinary research collaborations.
4. The teacher education institutions should highly be encouraged and supported through the promotion of maximum social networking system and inter-tertiary/local-connectivity just like the banking sector in order to improve/promote multidisciplinary research collaborations and innovations within the institutions.

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