

## CHAPTER 26

\_\_\_\_\_*Relevance of Information and Communication Technology in Research Development*\_\_\_\_\_

### **RELEVANCE OF INFORMATION AND COMMUNICATION TECHNOLOGY IN RESEARCH DEVELOPMENT IN NIGERIA UNIVERSITIES**

By

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#### **Abstract**

*Research as the cradle of knowledge generation, denotes the crucial position of research in stimulating the fortunes of a nation and ensuring the well-being of the citizenry in this knowledge-based era. This rationalizes why lecturers are expected to engage in the generation of new knowledge and promptly disseminate their research results to both government and industries. Teaching and research have experienced a paradigm shift from the traditional method that is anchored on chalk and talk, pen and paper, towards a new style of teaching and conducting researches occasioned by Information and Communication Technology (ICT). To uphold this, ICT is now admitted to become a foundation for innovation and enhancement of efficiency for many professional practices and roles across the globe in research purpose. Relating to professional roles of lecturers, particularly, the application of ICT tools has massively revitalized and reinforced lecturers' statutory roles through the effective delivery of education curriculum by creating multiple channels of interaction and enhancing research productivity. As a result, ICT turned out to be a dire necessity for lecturers to survive in this era when traditional pen, chalkboard and paper are gradually becoming forgotten subjects. This implies that ICT is now a superior option in handling all the academic activities lecturers embark upon, research, an integral part.*

**Key Words:** Information and Communication Technology, Research Development, Nigeria Universities

## **INTRODUCTION**

Throughout the world, universities are not just acknowledged as the pinnacle of higher education but as the nation's depositories of human knowledge. The knowledge and ideas gained in universities are important ingredients for the scientific, technological, economic and social advancement of research in any nation. The Federal Government of Nigeria has corroborated this by clearly stating in her National Policy on Education that university education's mission is to make an optimum contribution to national development by way of high-level manpower training, and to promote and encourage scholarship. This implies that Nigerian universities are both the providers of knowledge and professionals to be moved to society which serves as added competitive advantages of the country. To fulfill this lofty goal, university lecturers become major stakeholders in equipping people with the knowledge and skills in research required in undertaking tasks that can increase the developmental status of the nation. Thus, teaching and research are means through which lecturers actualize the dream of national development. It can therefore be stated that, research is a methodical inquiry with the view of increasing the body of knowledge for all-round development (Tor, Liviticus and Oluwafemi, 2020).

### **Information and Communication Technology (ICT)**

Mohod (2020) opined that ICT basically comprises of the information, telecommunication and media technology for collection, storage, processing, transmission and presentation of information which may be voice, data, text or images along with related services. ICTs can be grouped as;

1. Information and Communication Infrastructure (ICI): This deals with physical telecommunications systems and networks like cellular, broadcast, cable, modem, satellite, postal etc
2. ICT allied services which are internet, voice, mail, radio, television etc referring to the information collection, storage, processing, and presentation. Various technologies are combined and allowed to be used by the people and organizations to interact in the digital world for research.

Similarly ICT was explained as

Combination of computers, ancillary equipment, software, hardware services and resources interconnected together to form network that is fused in the

acquisition, storage, manipulation, management, movement control, interchange, transmission or reception of information. It is an umbrella term that includes all the manipulation and communication of information. Information and Communication Technologies encompass any medium to record information (magnetic disk/tape, optical disk, CD/DVD, flash memory etc and arguably paper records); technology for communicating through voice and sound image- microphone, camera, loud speakers and telephone to cellular phone. It also includes a range of technological equipment such as computers, mobile telephones; MP3/MP4/Window Media Audio (WMA), storage devices, file transfer protocols, satellites, World Wide Web etc are used for information exchange among people for different purposes. These devices are capable of both synchronous and asynchronous communication format, and the most advanced of these technological application is the concept of multimedia, which refers to teaching and learning devices that include a combination of data manipulator e.g. video, CD ROMs, floppy disks e.t.c which facilitate interactive communication between and among researchers (Akinola, 2011; 99)

It can be simply be said that ICT knowledge in research is “the ability to use digital technology, communication tools, and/or networks appropriately to solve information problems in order to function in an information literate society. Also, it includes the ability to use technology as a tool to research, organize, evaluate, and communicate information and the possession of a fundamental understanding of the ethical/legal issues surrounding the access and use of information for research (Jasrai, Patel, Patel and Jasrai, 2017).

### **Research Development**

Okpe, Simisaye, and Otuza (2013) in Tor, Liviticus and Oluwafemi, (2020) alluded to research as the cradle of knowledge generation, denoting the crucial position of research in stimulating the fortunes of a nation and ensuring the well-being of the citizenry in this knowledge-based era. This rationalizes why lecturers are expected to engage in the generation of new

knowledge and promptly disseminate their research results to both government and industries. By doing so, Chukwuedo and Igbinedion (2014) as cited in (Tor, Liviticus and Oluwafemi, 2020) noted that university research can serve as a strong source through which government and industries can accelerate national development.

Chukwuedo and Igbinedion (2014) in Tor, Liviticus and Oluwafemi, (2020) opined that research is also one of the means through which lecturers grow professionally by staying current in their scholarship and contribute significantly to national development through community services. In recognition of this, Egbri (2015) as noted Tor, Liviticus and Oluwafemi, (2020) opined that researches are conducted to discover, reinforce or refine knowledge and ultimately develop new knowledge that can become the basis for development. This implies that university research outputs are powerful tools for accessing and advancing knowledge and generating life-transforming ideas. But apart from this, university lecturers are also central in training minds through teaching.

According to Ezeugwu, et al., (2016), Kpolovie and Onoshagbegbe (2017) in Tor, Liviticus and Oluwafemi, (2020), teaching responsibilities of lecturers encompasses traditional pedagogy and supervision of students' research works, distance and technology-based learning/instructions in addition to organizing and directing of group/collaborative learning and general students mentoring/advising. The scope of teaching is beyond the four walls of a classroom. It assumes the dimensions of providing learners with the necessary skills under or outside the canopy of the classroom to enable them to become agents of change in society. In support, teaching should endow learners with experiences such as knowledge, understanding, skills, capacity ability, talents, information, and details required for use in the future through guidance and direction for research.

Given this, Ezeugwu, et al.,(2016), Kpolovie and Onoshagbegbe (2017) in Tor, Liviticus and Oluwafemi, (2020) expressed that university lecturers occupy a tremendous position in guiding students to secure the qualitative and quantitative amount of experience that will stimulate the maximal development of their in-built potentials. Moreover, teaching is the essential means through which the potentials needed for the nation's greatness, glory and wealth which are discovered, explored and channeled correctly without incurring wastages. With this, the importance of university lecturers is

underscored, seeing that their roles determine whether the future of a nation will be bright or bleak. Decades ago, teaching and research have experienced a paradigm shift from the traditional method that is anchored on chalk and talk, pen and paper, towards a new style of teaching and conducting researches occasioned by Information and Communication Technology (ICT).

### **Relevance of Information and Communication Technology (ICT) in Research**

Decades ago, teaching and research have experienced a paradigm shift from the traditional method that is anchored on chalk and talk, pen and paper, towards a new style of teaching and conducting researches occasioned by Information and Communication Technology (ICT) (Tor, Liviticus and Oluwafemi, 2020). To uphold this, Alandejani and Almadani (2018) in Tor, Liviticus and Oluwafemi, (2020), admitted that ICT has become a foundation for innovation and enhancement of efficiency for many professional practices and roles across the globe. Relating to professional roles of lecturers, particularly, the application of ICT tools has massively revitalized and reinforced lecturers' statutory roles through the effective delivery of education curriculum by creating multiple channels of interaction and enhancing research productivity. As a result, ICT turned out to be a dire necessity for lecturers to survive in this era when traditional pen, chalkboard and paper are gradually becoming forgotten subjects. This implies that ICT is now a superior option in handling all the academic activities lecturers embark on.

Undoubtedly, ICTs have significantly impacted on the quality and quantity of teaching and research. The advent of ICT has increased research productivity by providing academics in different locations with the platform to collaborate for research projects because of the borderless and distanceless nature of the Internet. The knowledge produced by such collaborations is published online for global consumption without the limitation of geographical space. ICT products such as productivity tools, Statistical Package for Social Sciences (SPSS), referencing software and anti-plagiarism software enhance research management from the conception of a research problem to data analysis and result transmission. E-learning tools such as wikis, podcasts, blogs, e-groups, webcasts, and other platforms are available to enable teaching within and outside the classroom environment. These developments seemed to have bulldozed the walls of lecture halls

because both teaching and learning can occur anywhere at any time and with anybody. However, lecturers must possess the required ICT skills before they can successfully integrate ICTs in conducting research and imparting knowledge (Tor, Liviticus and Oluwafemi, 2020).

In the same way, Ojeniyi and Adetimirin (2016), Iroaganachi & Izuagbe, (2018) ,Abba and Adamu (2019) in Tor, Liviticus and Oluwafemi, (2020) discovered that lecturers majorly possessed ICT skills in form of general computer operations, Internet browsing and Internet searching; and these skills influence their use of e-resources to support research endeavours. The outcome of this is increased research publication; enhanced quality of discussions at academic conferences; and improved participation in community service. In another study, it found that a high percentage of university lecturers considered were averagely proficient in using Internet services and resources for academic activities.

University of Cape Town, (2014) in Ankamah, Akussah and Adams (2018) The application of ICT in research has equipped researchers in the University of Cape Town (UCT) with world-class expertise and facilities in the: collection and management of research data; modelling, simulation and data processing through high-performance computing; comprehension of big data through visualization and data science techniques; dissemination of research outcomes (including data and workflows); promotion of collaborative research through virtual labs and cloud resources; and the development of customized research software, hardware and services This innovation is to provide students, faculty and the university community applications and services that can assist them in their research endeavours. In his study, Akpan (2008) as cited in Tor, Liviticus and Oluwafemi, (2020) disclosed that ICT use is strategic in improving the quality of researches and publications in Nigerian universities through the use of quality literature materials from the Internet. The use of ICT applications by lecturers assisted in smoothening their research experiences throughout the whole gamut of the research process. Educational investigation chores such as literature review, paper writing, spelling or grammar check, referencing, statistical analysis, and sending off manuscripts to publishers are now facilitated by technology. This has helped in relieving lecturers from huge financial burden and time previously expended on conducting inquiries. More than this, technology has provided a platform for lecturers from different universities of the nation to collaborate on research projects, thereby enriching the

intellectual content of research works as a result of inputs from diverse scholars. Knowledge gained from such investigations is now published online for global visibility and consumption. Despite these laudable benefits, there is still limited shreds of empirical evidence on how lecturers are applying their ICT skills in teaching and research in some Nigerian universities.

The possibilities of conducting research with ICT and its virtual components by individuals and organizations are innumerable. While going through research papers among others, several authors have mentioned that ICTs support: instantaneous information exchange despite geographical distances, costless accumulation of data and documents, improvements in the precision of knowledge reproduction, innovative and more effective routines to design new products and conduct problem solving activities both at individual and organizational level (UK Essays, 2021).

Now, a look at the main steps that are usually taken to conduct a research in the world indicated that research is complex. The first two steps in any research activity are:

- Problem Identification by Literature review or Environmental outlook
- Casing the Research title.

Research starts with an idea that researcher has. And now to conduct a research, that idea needs to be converted into a proper research question. Now to consider some ways in which ICT tools can be used to find Research topics and create bookmarks for later references. A search on the Web can be very effective in providing a context for an unknown quote or theory, in a timely manner. The use of search engines can save precious time in research (UK Essays, 2021).

Research indicates that about 85% of Internet users use basic search engines and search services like google to find specific information. However, it is also found that users are not satisfied at times with the performance of some search engines, for not giving focused results by way of providing articles and notes from personal blogs etc. along with quality research articles. Thus, basic search engines, like Bing and Yahoo, are helpful for researching business and popular culture, but they are not very useful for finding academic research papers or scholarly journal articles. Journal articles are available in a variety of formats, ranging from citations or brief abstracts to full text delivered electronically or in hard copy for research (UK Essays, 2021).

The following are some of the useful search engines used for research activities:

1. [www.ask.com](http://www.ask.com) -lists related searches, 2. [www.base-search.net](http://www.base-search.net): a multi-disciplinary search engine for academically relevant web, 3. Bing – Microsoft's search engine lists related searches, 4. Google Scholar – indexes scholarly research from many journals, books, papers, etc. across many disciplines, and 5. Yahoo! Search – originally a Web directory, it now features a reliable search engine.

Also, Metasearch engines allow to query various search engines simultaneously providing a single list of results. These can avoid duplication and provide additional ideas. Some of the very useful and popular metasearch engines are Clusty (Vivisimo), Ixquick and Mamma.com.

Subject Directories allow to browse Web pages by category , and are best used when there is a need to find a list of “general” Web sites pertaining to a topic . These are often compiled by human editors and provide annotated links pointing to reliable Web sites. Apart from the google and Yahoo Directory, there are a few others worth consideration which are the open directory- [www.dmoz.org](http://www.dmoz.org) and [www.opendoar.org/search.php](http://www.opendoar.org/search.php). Also, Subject-specific search engines tend to focus solely on a topic and allow to narrow results and ensure that these are relevant. Many subject specific resources can be found listed by various University Library departments in the Library Research Guides. The following tools represent only a sampling: Pinakes, Launchpad, Infomine, Scirus, Hakia, Education World and Business.com (UKEssays, 2021).

UK Essays, (2021) expressed that Social Bookmarking is tagging a website and saving it for later. Instead of saving them to web browser, we are saving them to the web. Having started out as a way to store browser bookmarks online so that they can be utilized on different computers and shared, social bookmarking has grown to such an extent that it can now be used to search the web instead of relying on traditional search engines. In fact, social bookmarking sites are being used as intelligent search engines. Most social bookmarking sites allow to browse through the items based on most popular, recently added, or belonging to a certain category like technology, politics, blogging, news, sports, etc. Examples of Social Bookmarking sites are [Del.icio.us](http://Del.icio.us) , [Magnolia](http://Magnolia), [Blinklist](http://Blinklist), [esnips](http://esnips) etc. All these resources are relevant in research development. In evaluating and citing Web sites, there are some words of caution to imbibe:



1. All types of information are available on the Web, and some not for free.
2. Unlike traditional published sources, Web documents have not necessarily been evaluated hence the need to assess the quality of the documents is very crucial for a researcher. Information on the Web can originate from many different sources including individuals, organizations, governments, academic institutions and companies. It is therefore important to quickly assess the reliability of the sources found. The major points of check when evaluating a Web site are: Currency, Authority, Purpose and Point of view (UK Essays, 2021).

In this phase of research there has to be active Participant Involvement. The researchers has to have proper Survey Design, correct Sampling and have to sort out all Statistical issues for conducting Qualitative/Quantitative Research. In the following three ways ICT Tools can be used by researchers for qualitative research. As a medium of communication, ICT tools provide powerful communication channels mostly text based but increasingly enhanced with moving and still images and sound, thus competing fairly with the traditional medium of interaction. Researchers can log into any of these channels and practices, either for studying the way people use computer mediated communication in cultural context or can utilize these to interact with participants by initiating a discussion for research (UKEssays, 2021).

As a network of computers -Internet, the most popular and powerful ICT tool, breaks all boundaries and makes physical distances between researchers disappear thus providing a platform like online research communities, blogs and discussions forums to reach out to people all across the globe for collective and collaborative research with seamless possibilities for the researcher to utilize information. As a context of social construction, the web2.0 facilitates the researchers to witness and analyse the structure of conversation by either participating or simply observing, the social structures that emerge. This gives a good insight to the researcher while gathering data and then during analysis on how language builds and structures social reality (UKEssays, 2021).

### **Data Collection, Collation and ICT**

In research, data collection could require collaboration. A word of caution to the researcher is to take care of Intellectual property related issues in advance while using Internet and web2.0 tools for data collection and storage. The qualitative research process starts with a Questionnaire/

Survey Design. Survey can be created using ICT tools Web, Word Processors (WP), Spreadsheets and now most popular online tools like google-forms and surveymonkey.com, and can be distributed using email and discussion boards. The data collected using one or many such online tools needs a proper Database structure for storage and retrieval thus tools like relational databases ( Structure Query Language,SQL, Server, ORACLE etc.) ; open sources databases using MySQL and Access, Flatfile database using Spreadsheet, wikis, GIS [Google earth, Google Maps, Flickr, Arcview/explorer]) can be used(UKEssays, 2021).

Data Analysis is an area where a lot of works is being done and a huge collection of open source tools are available for researcher e.g. for Relationship mapping techniques, SWOT Analysis, etc. software like Inspiration, kidspiration, smart ideas, Cmap, Mindmapper, freemind would be useful and also the opensource Online tools available at [www.gliffy.com/](http://www.gliffy.com/), [www.mindmeister.com](http://www.mindmeister.com), [www.drawanywhere.com/](http://www.drawanywhere.com/) are relevant to data analysis (UKEssays, 2021).

The applicability of ICT based analytical tools in qualitative research is debated as it is argued, that the original meaning inherent in the data could be distorted or lost in the process of data analysis. Thus the employment of computer programs in qualitative data analysis is a practice that should be viewed with caution. Analyzing qualitative material that is based on speech or texts derived from interviews and conversations must have regard for the context and the integrated whole. Computer based systems to aid with analysis are, often based on the natural scientific view of the world that sees social phenomena as reflections of the higher level ordering of an objective social structure. The ideal data type here is one which is amenable to quantifying and segmentation into discrete categories as this allows for numerical manipulation and analysis. Researchers who make use of these packages must remain alert to the need to preserve the integrity and context of the original material and not lose sight of this during the process of coding and subsequent analysis (UKEssays, 2021).

### **Research Reporting, Dissemination and ICT**

The final step in the process of any research activity is writing up research by Research Reporting Guidelines. When writing research report, it is advised to use the word processors. To make the research outcomes reach maximum

numbers of stake holders, proper planning for printing, mailing and/or posting on community forums plus translation is required. Making research results accessible to various audiences through website, Research Portfolio, Newsletter, and other Community reports is now a common practice. Presenting research at Conferences/ Seminars and thus making findings known to users should be planned. Events happening across the globe on the theme of research can be found out easily today through Internet.

Web pages, as with journal articles, books, encyclopedias and other material consulted while researching, need to be properly cited in a bibliography, a reference list or a list of works cited. There are a lot of Citation & Style Guides online which provide more information on citation (UKEssays, 2021).

Thus, there are some innovative tools available today that support researchers in the entire research process i.e. researcher can get help to Search intelligently, assess the quality of search results, help in recording, organizing and producing information using online notecards, and also help in formatting the bibliography in MLA, APA, or Chicago/Turabian whichever style that is required. Summarily, ICT tools help researcher in the following research related tasks

- identify appropriate information sources
- critically analyse information
- research effectively
- manage information
- use information to extend and communicate knowledge across subject fields
- search up to ten databases and electronic resources simultaneously
- receive results in a common format
- link to individual databases for more specialised searching
- select favourite resources and e-journals; save searches and records, setup email alerts etc.

### **Challenges and Proffered Solutions on the Use of ICT in Research**

From the study of Adegbore, Adeniji and Adeshina (2015), it was revealed that stress and frustration contribute negatively to students and lecturers in their use of ICT for research. It implies that there is a need to create conducive environment for them and guide the student in the proper ways of

getting the best from the ICT infrastructures for research. Here is a need to create cyber cafes in student hostels for conveniences of student when using ICT for research. Also there is need for the management to give good internet service provider to students as slow internet connection contributes to stress and frustration among the students. And it was also highlighted that there was stress and frustration as a result of lack of interest by the students to continually use ICT for research. Hence, there is need for government, school administrators or stakeholders to draw out programmes or training that will interest the students towards ICT education.

### **Conclusion and Recommendations**

ICT has provided many tools for researchers. Researchers with the aid of search engine and scientific Web based search software can be choose their research subject more comfortable. Online Scientific databases and digital library provides researchers access to research findings associated to their topic and also related works. And finally Tools such as online forums and virtual social networks have created a wide variety of facilities for researchers to communicate with each other and be aware of their scientific activities (Nakhaei, BaniHashemi and Ghafouri 2016). In conclusion, Ankamah, Akussah and Adams (2018) summarized that the use of ICT in research had become an important facility in students and lecturer research in terms of getting access to better storage media, improved data analysis technologies, citation and compiling bibliographies, and publishing. For this reason, academic institutions should invest in ICT facilities that are relevant in undergraduate and postgraduate students' research work. There should also be regular training programs such as seminars and workshops for postgraduate students and lecturers in the use of ICT applications. This will help them perceived ICT tools usefulness in research.

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