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# Research Skills, ICT Application and Sustainable Library Development

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## Abstract

*This study investigated research skills, ICT application and sustainable library development. Descriptive survey research design was used for the study. The population of the study was 142 librarians working in the university libraries of twelve universities in South-west, Nigeria. Purposive sampling technique and total enumeration sampling technique were employed for the study. Data were collected using well-structured questionnaire. Six research questions were raised and three hypotheses were tested at 0.05 level of significance using Pearson-Product Moment Correlation Coefficient. The findings of the study revealed that: sustainable library development was primary to librarians; librarians exhibited high need for research skills that would enable them to perform optimally on their job; development of research skills had enormous consequences on research performance of librarians; and ICT was a necessity in ensuring sustainable library development. Hypotheses tested revealed that there was significant relationship between research skill and sustainable library development; between ICT application and sustainable library development; and the joint influence of research skills and ICT application was not significant on sustainable library development. It was recommended that librarians should maintain high level of research skills and ICT application towards ensuring sustainable library development.*

**Keywords:** ICT application, library, research skills, sustainable library development

## 1. Introduction

Library has been and will continue to be one of the keys around which advancement in tertiary education is structured. Sustainable library development is pivotal in the continuous process of delivering quality education and conducting empirical research in the modern period than at any previous time. The pursuit of sustainable library development is a significant policy goal of universities and institutions across the world including the United Nations, World Bank, and the World Trade (Elliott, 2006). Literally, sustainable library development includes ensuring development of library over time. In the modern period, the link between research skills and ICT application as the basic tools for ensuring sustainable library development has been appreciated in many literature (Kate, Parris & Leiserowitz, 2005; Lee, Holland & McNeill, 2000).

Sustainable library development is one of the overall sustainable development plans of the United Nations in the United Nations 2030 Agenda. Access to information has been acknowledged as primary under Sustainable Development Goal 16: promotion of peaceful and inclusive societies for sustainable development; provision of access to justice for all and build effective, accountable and inclusive institutions at all levels (ALIA, n.d). Target 16:10 of the 2030 Sustainable Development plan is to 'ensure public access to information and protect fundamental freedom, in accordance with national legislation and international agreement. In Lyon Declaration on Access to Information and Developments, it was stated that half of the world's population lacked access to (online) information. Meanwhile, in our knowledge society, libraries is in prime position to provide access and opportunity for all (IFLA, n.d)

One of the core concepts in sustainable library development is to use ICT and research skills to assist the development needs of libraries and librarians. Sustainable development refers to the development that meets the needs of the present without compromising the ability of future generation to meet their own needs (World Commission on Environment and Development, 1987). It is the organizing principle through which human development goals are met and at the same time sustaining the potentials of natural resources upon which the economy and society depend.

Primary to academic institutions is the presence of academic libraries through which scholars are able to get information resources to increase their frontier of knowledge. The conduct of empirical research requires the development of research skills and application of ICT in the modern

days. Hence, the sustainable development of libraries in the modern period requires that librarians develop vast research skills and at the same time be robustly complying with the emerging trends in ICT applications.

Librarians are increasingly called upon these days, not just to support the research of academics in other disciplines, but also to be proficient researchers in their own right. Heeding this obligatory clarion call, academic librarians are now producing research and scholarly works of their own to assist them have better knowledge of the profession and to contribute back their own knowledge, skills and experience (Canadian Association of Research Libraries, 2010). Even, since the assumption of faculty status by the library, librarians in universities are consigned to conduct research as a mandatory requirement for their career progress. However, it is obvious that educational research is complex in nature to the extent that none of the existing methodological approaches can be enough to mirror its complexity (Fernate, Surikova, Kalnina & Romero, 2009). Hence, the need to possess the basic research skills that would aid the proficiency of the librarians in making their pedagogical experience available to the wider world by the way of research productivity.

The vision of sustainable library development takes into consideration the ICT and research dimension of human development. Research skills are one the most vital skills required for sustainable library development. Onus is therefore on academic librarians to develop their discipline through a research-based method by creating environment that includes vital integration of research activity and ICT application (Deem, 2007; Haverhals, 2007).

Ensuring sustainable library development in the modern period requires continuous acknowledgement of libraries as the warehouse of information resources needed for global advancement. Most of these resources are kept in digital format. 21st<sup>st</sup> century librarians are therefore expected to be fully ICT compliant and endear themselves with the current trends in research skills. This is so as ICT and research skills are integrated in every facet of library operations. Libraries are by all standards at the forefront of the digital transformation and provision of digital information infrastructures and at the same time manage and curate cultural heritage collections. This ushers in modern ways of involvement with information and knowledge and the need to rethink skills and competency profiles that will enable academic librarians to support e-research all along the research cycle (Schmidt, Calarco. Kuchma & Shearer, 2016).

## **1.2 Objectives of the Research**

The objectives of the study are to:

1. know what constitute sustainable libraries development
2. to investigate the extent of research skills needed by librarians for sustainable library development;
3. examine the impact of research skills of librarians on sustainable library development;
4. investigate the extent of application of ICT in library;
5. examine the impact of ICT on library operation; and
6. find out the challenges militating against ICT for sustainable library development.

## **1.3 Research questions**

The following research questions guide the study:

1. What constitutes sustainable library development?
2. What is the extent of research skills of librarians for sustainable library development?
3. What is the impact of research skills of librarians on sustainable library development?
4. What is the extent of application of ICT in the library?
5. What is the impact of ICT on library operation?
6. What are the challenges militating against the application of ICT for sustainable library development?
- 7.

## **1.4 Hypotheses**

The following null hypotheses were tested in the study.

1. There is no significant relationship between research skills and sustainable library development.
2. There is no significant relationship between ICT application and sustainable library development.
3. There is no significant relationship between joint influence of research skills and ICT application on sustainable library development.

## **Literature Review**

### **2.1 Sustainable library development**

Massive and qualitative human capital development with emphasis on the development of research skills and ICT application are factors responsible for the sustainable development of the more advanced nations of the world in the last half century (Bogoro, 2014). Integral elements of sustainable development are research and the application of ICT because their outputs are expected to have direct effect on humanity. It is even now evident that the development of research skills and the use of ICT by librarians is a concerted endeavor facilitated to stimulate and expedite advancement in the delivery of library services. Librarians now play remarkable roles in development processes in educational sector, with great emphasis on the development of research skills and ICT application for sustainable library development in most developing countries, including Nigeria.

The United Nation 2030 Agenda for Sustainable Development is a framework of 17 Sustainable Development Goals spanning economic, environmental, educational and social development (IFLA, 2018). Libraries are one of the key institutions for actualization of the goals. Libraries as institutions are deeply involved in the creation of UN 2030 Agenda, advocating for the inclusion of uninterrupted access to information, safeguard territorial cultural heritage, universal literacy, and access to information and communication technologies (ICT) in the framework. Access to information is also a target under Sustainable Development Goal 2030.

Given the current developmental needs in library for sustainable development across the world, countries that treasure development have to adopt library information use policies by the way of allocating adequate fund to research with a view to generating pertinent knowledge that will influence livelihoods (Altibach 2009). Ensuring sustainable library development requires that the research skills of librarians together with maximum application of ICT to library operations are enhanced. In August 2013, the Association of Research Libraries (ARL), the Canadian Association of Research Libraries (CARL), the Association of European Research Libraries (LIBER), and the Confederation of Open Access Repositories (COAR) launched the joint Task Force on Librarians' Competencies in Support of E-Research and Scholarly Communication. These include ICT and research skills, among others.

### **2.2 Research skills**

Global educational growth and competitiveness rests significantly on application of ICT, driven by a well-planned vibrant research skills acquisition system which integrates the research prowess of higher education with the demands of industry and larger society. Tertiary Institutions all over the world are usually the key drivers of research and development activities (Bogoro, 2014). As a result of the declining quality of research infrastructure in tertiary institutions coupled with the declining quality of the academics, lack of financial incentive for publications and paucity of fund, research output of librarians in Nigerian universities have been at a very low level. Also, the level of investment by governments in innovative research and development and education determines the global competitiveness of their nations (Bogoro, 2014). As such, academics and administrators of universities are expected to develop research skills in compliance with the global trends in educational sector.

Quantifying the research skills of academics is hard due to the variations in research processes in different disciplines. However, a number of writers have measured the research skills to varying extents (Willison & O'Regan, 2007; Monash University, 2013). Research Skill Development (RSD) Framework developed by Willison & O'Regan (2007) is applied in many disciplines across the world in the assessment of research performance in higher schools of learning. The framework sees research as a continuum of knowledge production, from knowledge new to the researcher to knowledge new to humankind, moving from the commonly known, to the commonly not known, to the totally unknown.

Acquisition of research skills is mandatory for the health of librarianship as a profession. The research skills required of librarians are:

- 1. Critical thinking skill:** This involves examining the truth, reality and validity of an argument. It as well evaluates the significance of ideas. Successful use of critical thinking skill requires background skills which include imagination and creativity, logic and reasoning, conceptual thinking, reflection and feedback.
- 2. Problem solving skill:** This involves the ability to identify, define and analyse issues. It also includes creating and evaluating solutions. Successful application of problem solving skill requires imaginative and innovative thinking to find modern methods to address a problem, analytical skills to examine the results of a particular problem, as well as reasoning skills to juxtapose the solutions against one another.
- 3. Analytical skills:** This involves data and information gathering ability and applies methods of synthesis, critical thinking and data reduction to locate and comprehend patterns and connection in that data. The use of analytical skill enables researchers to analyse, manage and update existing database.
- 4. Information dissemination skill:** This involves communicating with others the rationale and results of research. It involves the ability to scrutinize information, explain the goals, motives, outcomes and conclusion of the research.
- 5. Computer skill:** This represents a type of link between technical and scientific work and widely generalized communication and organizational tasks. It involves the application of statistical softwares and databases, and creation of records and publications using programs such as microsoft office. In a study conducted by Farhangnezhad and Bordbar (2013) which aimed at identifying and evaluating the ICT skills needed by librarians of public libraries in Yazd, it was revealed that skillfulness in using specialized software application, general software applications, ICT and search skills were the most vital skills needed by librarians.
- 6. Research data management (RDM) skills:** These involve services and infrastructures that corroborate the management of research data throughout the data lifecycle (i.e. creating/collecting, processing, analyzing, publishing, archiving/preserving, re-using data) (Schmidt, Calarco, Kuchma & Shearer, 2016). RDM skills are often deployed across different support services (research office, IT services, and library) and academic departments.

### **2.3 ICT Application and sustainable development in librarianship**

Modern libraries are being shaped by emerging technologies that are transforming the way information is created and disseminated (Aina, Okunnu & Dapo-Asaju, 2014). Progressive changes in technology and associated paradigm shifts in research and scholarly communications are obviously changing the role of libraries in the 21st century. The advent of e-research has brought about new ways of doing research across the globe, mandating libraries to adopt new services, which include helping with the development of research data management plans, hosting collaborative virtual research environments, managing institutional repositories, and disseminating research findings through open access mechanisms (Schmidt, Calarco, Kuchma, & Shearer, 2016). Proficient use of ICT is becoming obligatory in academic environment. It has even become one of the appointment requirements in the modern days. 21st Century librarians are required to be technologically-savvy (Canadian Association of Research Libraries, 2010). Librarians are expected

to excel in the digital environment. They should be expected to be actively involved in the exploration and implementation of modern technologies in their libraries. Through the implementation of a variety of digital web-based projects, initiatives and infrastructures, librarians are able to preserve, extend, and facilitate access to information and knowledge comprising humankind's cultural, scientific and intellectual heritage.

ICT refers to tools and as well as means used for collection, capture, process, storage, transmission and dissemination of information (Ebijuwa, 2005; ToAnyakoha, 2005). ICT is the application of computers and other technologies to the acquisition, organization, storage, retrieval and dissemination of information. Swift and unobstructed access to the required information is of major importance in academic libraries. Information processing, storage, communication, dissemination of information automation, etc, coupled with the advent of the Internet and development of World Wide Web, revolutionized the information communication technology (Saleem, Shabana & Batcha, 2013). As a result of this, the application of ICT in libraries becomes important in an effort to provide information in soft form to the user community.

Canadian Association of Research Libraries (2010) opines that academic librarians should have vast knowledge and capability in the following areas:

1. Integrated library systems (ILS): This includes the knowledge of basic structure, content and use of an integrated library system. Through integrated library system, the various activities of the various units of the library are centrally coordinated through computer networking system to aid easy access to information and integrate the efforts of the units towards the achievement of the goals of the library.
2. Emerging web technology: The current developments ushered in by web technology have monumental consequences in the performance of library operations. Knowledge of major trends in web development including online social networking tools (as of 2010, Twitter, Facebook, MySpace, etc.) adds value to the importance of academic libraries.
3. Electronic resources management: It is vitally obligatory for modern day librarians to have knowledge of how digital resources are acquired, managed and accessed. Information resources management has become an integral part of library management, more so that most of library resources are in digital form.
4. Web page development: Digital librarianship is recording unprecedented success in the 21st century. Digital librarians and information scientists are expected to have appreciable understanding of principles of web page design and maintenance. Digital librarians are digital system analysts and database administrators in their own right with proficient ability to design, manage and maintain library WebPages.
5. Institutional repositories: Management of institutional repository is a mandate of archivists who have requisite knowledge of digital record keeping such as electronic filing, cataloguing and information resources processing. Understanding the basic structure, content and use of campus institutional repositories requires that archival librarians who manage institutional repositories have good understanding of the application of ICT to library practices.
6. Database management: Academic libraries are expected to have internal database manager to reduce the cost of hiring external personnel to manage the database of the library. Understanding how databases are designed and structured for convenient data and/or information retrieval requires that library has proficient librarians in the use of ICT.

## **2.4 Impact of ICT on Library Operations**

ICT occupies a robust position in library operations. As information activities are undergoing rapid and tremendous transformations from conventional methods through the introduction of new technologies, the delivery of library services is made easier. Some of the impacts of ICT in ensuring library development, as recognized by Vijayakumar and Vijayan (2011), include aiding word processing, text editing, character recognition, voice recognition, electronic publishing, magnetic storage, videotext, tele-text, computer disk, electronic data processing, artificial intelligence/ expert systems, database management system, information retrieval off-line and on-line, electronic mail,

electronic document delivery, and computer conferencing. ICT aids proficient classification and cataloguing, indexing, bibliographic compilation and abstracting.

Library activities are migrated from their conventional form to digital form through the application of ICT. ICT helps library professionals to provide value added quality information service and give more remote access to the inter-nationally available information resources ( Saleem, Shabana & Batcha, 2013). ICT facilitates the storage of huge amounts of data or information in a very compact space. ICT facilitates rapid transmission speed as well as easy access to information resources in order to ensure satisfaction of the users with complex demand. ICT eradicates the distance barrier thereby shortening the time required to access information and ensure the right information to the right reader at the right time. ICT encourages comprehensive collaboration and creation of library networks, eliminate repetition of efforts within a library, augment the range of services provided, increases efficiency and improve the quality of library services.

## **2.5 Areas of Application of ICT in Library Operations**

Ensuring sustainable library development requires that ICT is applied to all library operations. As a repository of recorded knowledge, library makes use of ICT for the benefit of mankind. The librarian's choice of ICTs includes the series of technologies that can be applied in the library activities/ operations and services for collection, processing, storage, retrieval and dissemination of recorded information. ICT is crucially applicable to a large extent in the performance of nearly all the activities in the library. Vijayakumar and Vijayan (2011) and Saleem, Shabana and Batcha (2013) posit that ICT is fundamentally crucial in the following areas of the library:

- 1. Library Management:** This includes classification, cataloguing, indexing, database creation, database Indexing. These are the basic routine services of the library that require the application of ICT. The application of ICT enables library management to be geared up towards goal achievement.
- 2. Library Automation:** Through library automation, human intervention in all the library services is reduced such that users can get the desired information with the maximum ease and at reduced cost. Library databases and all housekeeping operations of library are the two main areas where automation can be applied in library.
- 3. Library Networking:** This refers to interconnectivity of library operations across the different units/divisions. Library networking indicates a group of libraries and information centers are interconnected for some common pattern or design for information exchange and communication with a view to improving efficiency. The common goal for the interconnectivity is to enhance efficiency in the performance of library operations.
- 4. Audio-Visual Technology:** This includes photography, microfilms, microfiches, audio and tapes, printing, optical disk, etc.
- 5. Technical Communication:** This includes technical writing, editing, publishing, DTP systems etc.
- 6. Digital Library:** This refers to assembling digital computing, storage and communication machinery together and as well providing the content and software required to reproduce the services provided by conventional libraries based on paper and other material means of collecting, cataloguing, finding and disseminating information. A full-fledged digital library should accomplish all important services of conventional libraries and also bank on the well-known advantage of digital storage, searching and communication.

## **2.6 Congruence of research skills and ICT application**

Academic libraries have important role to play in the development of research, research skills and research culture in any nation. The application of technologies to the various functions and activities of libraries requires library personnel to be groomed in ICT in order to catch up with the emerging sophistication in the field of library and information science. Failure to move with the modern trends in ICT use will render many librarians stranded in their research efforts as the development of research skills is contingent on maximum compliance with ICT. Academic libraries

are therefore expected to motivate their staff who have a higher level of research skills by the way of sponsoring them for conferences and trainings in the use of ICT for efficient delivery of library services.

The roles of the 21st Century academic librarian are grounded on a more solid foundation of professional practice aided enormously by deep understanding of the use of ICT. The successful librarians develop proficient research skills and as well build and maintain a strong, well-rounded understanding of the application of ICT. Traditional skills, like written and verbal communication, are still very important. However, increasing emphasis is placed on research skills and the use of ICT which help in the development of innovative new programs.

All over the world, the roles of librarians are being reassessed by academic libraries with a view to knowing their core competencies in the application of research skills and ICT in performing their roles.

### 3. Methodology

The study adopted the descriptive survey research design to investigate the relationship between research skills, ICT applications and sustainable library development. The population of the study was 142 librarians working in the university libraries of twelve universities in South-west, Nigeria. Two sampling techniques were used for the study, namely purposive sampling technique and total enumeration sampling technique. Four federal universities, four state universities and four private universities in South-west, Nigeria, were purposively selected for the study while total enumeration sampling technique was used to capture the entire librarians in the twelve selected universities.

The data collection instrument used for the study was questionnaire. The research questions were analysed using descriptive statistics (mean and standard deviation) and simple percentage. Three hypotheses were tested at 0.05 level of significance using Pearson-Product Moment Correlation Coefficient. The names of the universities whose libraries were covered under the study and the breakdown of the responses received are:

1. University of Ibadan (UI)	20
2. University of Lagos (UNILAG)	12
3. Federal University of Technology, Akure	11
4. Osun State University of Technology	6
5. Joseph Ayo Babalola University (JABU)	6
6. Afe Babalola University (ABUAD)	6
7. Ekiti State University, Ado Ekiti (EKSU)	6
8. Federal University, Oye Ekiti (FUOYE)	5
9. Adekunle Ajasin University, Akungba-Akoko (AAUA)	4
10. Ondo State University of Science and Technology, Okitipupa (OSUSTECH)	4
11. Elizade University, Ilara-Mokin (ELIZADE)	3
12. Wesley University of Science and Technology, Ondo	3
Total	86



#### 4. Results and Discussion of Findings

**Table 1:** Demographic variables of the Respondents

Variable	Frequency	Percentage (%)
<b>Gender:</b>		
Male	45	52.33
Female	41	46.67
Total	86	100
<b>Status:</b>		
University Librarian	0	0
Deputy University Librarian	2	2.33
Principal Librarian	28	32.56
Senior Librarian	24	27.91
Librarian I	20	23.36
Librarian II	12	13.95
Total	86	100
<b>Age Group:</b>		
21 – 30	2	2.33
31 – 40	21	24.42
41 – 50	36	41.86
51 and above	27	31.40
Total	86	100
<b>Years of Experience as Librarians:</b>		
1 - 10	29	33.72
11 – 20	32	37.21
21 – 30	20	23.26
31 and above	5	5.81
Total	86	100
<b>Academic Qualifications:</b>		
PhD	21	24.42
M.Phil.	2	2.33
Masters	63	73.26
B.Sc.	0	0
Total	86	100

Table 1 shows the demographic variables of the respondents. Gender analysis revealed that 45(52.33%) of the respondents were male while 41(46.67%) were female. This means that there were more male librarians than female librarians in universities libraries in South-west, Nigeria. Majority of the respondents were Principal Librarians 28(32.56%), Senior Librarians were 24(27.91%), Librarian I 20(23.36%), Librarian II 12(13.95%), and Deputy University Librarian 2(2.33%). Age group of the respondent indicated that majority of the librarians are within the age 41-50, 36(41.86%). This was followed by the age range of 51 and above 27(31.40%). Those within the age range 31-40 were 21(24.42%), while the least was 21-30, 2(2.33%). This means that a good number of the librarians still have enough years to render their productive services in the libraries.

Categorization of the respondents based on years of experience as librarians revealed that those who had spent between 11-20 constituted the highest number with 32(37.21%), followed by 29(33.72%) had spent between 1-10. 20(23.26%) had spent between 21-30, while those who had spent 31 and above was 5(5.81%). The study further revealed that respondents with masters degree constituted the highest number with 63(73.26%), followed by Ph.D holders 21 (24.42%). M.Phil holders were 2(2.33%), while first degree holders were 0(0%).

**Research Question 1: What constitute sustainable library development?****Table 2: Sustainable library development**

Development	SA		A		D		SD		Mean
	No	%	No	%	No	%	No	%	
Development of skills to evaluate more accurately the sources of information.	47	54.7	39	54.3	1	-	0	-	3.55
Development of skills to access digital platforms for cultural heritage.	51	59.3	31	36	3	3.5	1	1.2	3.53
Enhancement of scientific research through the development of research skills.	46	53.5	39	45.3	1	1.2	0	-	3.52
Enhancement of the use of technology to promote education.	42	48.8	44	51.2	0	-	0	-	3.49
Ensuring public access to information and intellectual freedom.	36	41.9	50	58.1	0	-	0	-	3.42
Strengthening of library to advocate for equitable access to information.	42	48.8	36	41.9	4	4.7	4	4.7	3.35
Encouragement of universal literacy.	35	40.7	45	52.3	4	4.7	2	2.3	3.31
Development of scholarly skills.	31	36	49	57	5	5.8	1	1.2	3.28
Preservation of indigenous knowledge.	30	34.9	47	54.7	6	7	3	3.5	3.21
Resource sharing among libraries.	28	32.6	49	57	7	8.1	2	2.3	3.20

Ranking of what constituted sustainable library development in university libraries in South-west, Nigeria is as follows: nearly all the librarians believed that development of skills to evaluate more accurately the sources of information constituted sustainable library development (Mean = 3.55). This was followed by development of skills to access digital platform for cultural heritage (Mean = 3.53); enhancement of scientific research through the development of research skills (Mean = 3.52); enhancement of the use of technology to promote education (Mean = 3.49); ensure public access to information and intellectual freedom (Mean = 3.42); strengthening library to advocate for equitable access to information (Mean = 3.35) ..., etc. This means that sustainable library development is primary to librarians.

**Research Question 2: What is the extent of research skills of librarians in university libraries for sustainable library development?**

**Table 3: Extent of Research skills needed by librarians for sustainable library development**

Skills	VHE		HE		LE		VLE		Mean
	No	%	No	%	No	%	No	%	
Problem solving skill	70	81.4	10	11.6	6	7	0	-	3.74
Information dissemination skill	61	70.9	25	29.1	0	-	0	-	3.71
Analytical skill	44	51.2	37	43	5	5.8	0	-	3.45
Critical thinking skill	36	41.9	50	58.1	0	-	0	-	3.42
Computer/ICT skills	40	46.5	41	47.7	5	5.8	0	-	3.41

Table 3 shows the extent of research skills of librarians in university libraries in South-west, Nigeria. Majority of the librarians indicated that they need problem solving skill (Mean = 3.74). This was followed by information dissemination skill (Mean = 3.71). Also, almost all of them indicated that they needed analytical skill (Mean = 3.45). Several of them responded that they needed critical thinking skill (Mean= 3.42) and computer/ICT skill (Mean = 3.41). This means that the respondents exhibited high need for the research skills that would enable them to perform optimally on their job.

**Research Question 3: What is the impact of research skills of librarians?****Table 4: Impact of research skills on research performance of librarians**

Impact	SA		A		D		SD		Mean
	No	%	No	%	No	%	No	%	
Development of ability to exploit new topics in librarianship	49	57	34	39.5	3	3.5	0	-	3.53
Improved research productivity	42	48.2	44	51.2	0	-	0	-	3.49
Value is added to research	42	48.2	42	48.8	2	2.3	0	-	3.47
Improvement in performance of educational roles	37	43	49	57	0	-	0	-	3.43
Capacity to generate new ideas	38	44.2	45	52.3	3	3.5	0	-	3.41
Research becomes more empirical	39	45.3	40	46.5	5	5.8	2	2.3	3.35
Ability to understand all forms of research in librarianship	37	43	42	48.8	7	8.1	0	-	3.35
Better understanding of topics in librarianship	32	37.2	50	58.1	4	4.7	0	-	3.33
Capacity for applying knowledge in practice	26	30.2	54	62.8	3	3.5	3	3.5	3.20
Improved efficiency in the conduct of multifaceted research	25	29.1	49	57	9	10.5	3	3.5	3.12

Table 4 shows the impact of research skills on research performance of librarians. Majority of the librarians indicated that research skills lead to the development of ability to exploit new topics in librarianship (Mean = 3.53) followed by improved research productivity (Mean = 3.49), value is added to research (Mean = 3.47), improvement in performance of educational roles (Mean = 3.43), capacity to generate new ideas (Mean = 3.41), research becomes more empirical (Mean = 3.41), ability to understand all forms of research in librarianship (Mean = 3.35), better understanding of topics in librarianship (Mean = 3.33), capacity for applying knowledge in practice (Mean = 3.20), and improved efficiency in the conduct of multifaceted research (Mean = 3.12). This implies that the development of research skills have enormous consequences on research performance of librarians.

**Research Question 4: What is the extent of application of ICT in the library?****Table 5: Extent of application of ICT in library operations**

Library Operation	VHE		HE		LE		VLE		Mean
	No	%	No	%	No	%	No	%	
Digitization of library resources	35	40.7	46	53.5	5	5.8	0	-	3.35
Library networking	35	40.7	46	53.5	5	5.8	0	-	3.35
Resource sharing	35	40.7	46	53.5	4	4.7	1	1.2	3.35
Library automation	35	40.7	43	50	8	9.3	0	-	3.31
Information packaging	36	41.9	39	45.3	11	12.8	0	-	3.29
Library management	35	40.7	40	46.5	10	11.6	1	1.2	3.27

Extent of application of ICT in the library is revealed in Table 5. Nearly all the respondents indicated that ICT was deployed to a high extent in digitization of library resources (Mean = 3.35) and library networking (Mean = 3.35), and this was followed by resource sharing (3.34). It was further revealed that ICT was deployed to a large extent in library automation (Mean = 3.31), information packaging (3.29), and library management (Mean = 3.27). This means that ICT is

deployed to a vast extent in carrying out the various activities of the library, more so that the respondents claimed that the application of ICT facilitates resource sharing among libraries.

**Research Question 5:** What is the impact of ICT on library operation?

**Table 6:** Impact of ICT on sustainable library development

Impact	SA		A		D		SD		Mean
	No	%	No	%	No	%	No	%	
Resource sharing among libraries	53	61.6	33	38.4	0	-	0	-	3.62
Accurate storage of information	40	46.5	46	53.5	0	-	0	-	3.47
Faster library work	35	40.7	47	54.7	4	4.7	0	-	3.36
Reduction in space	34	39.7	49	57	3	3.5	0	-	3.36
Promotion of teamwork	35	40.7	45	52.3	6	7	0	-	3.34
Stable/ round-the-clock access to information	32	37.2	49	57	5	5.8	0	-	3.31
Security of information	27	31.4	57	66.3	2	2.3	0	-	3.29
Promotion of flexible library operation	35	40.7	40	6.5	11	12.8	0	-	3.28
Provision of remote access to users	35	40.7	40	6.5	20	11.6	1	1.2	3.27

Table 6 reveals the impact of ICT on sustainable library development. All the respondents indicated that ICT facilitated sustainable library development by the way of resource sharing among libraries (Mean = 3.62), followed by accurate storage of information (Mean = 3.47). It was further indicated by the respondents that the impact of ICT in sustainable library development leads to: faster library work (Mean = 3.36), reduction in space (Mean = 3.36), promotion of teamwork (Mean = 3.34), stable/ round-the-clock access to information (Mean = 3.31), security of information (Mean = 3.29), promotion of flexible library operation (Mean = 3.28), and provision of remote access to users (Mean = 3.27). This implies that the respondents believed that ICT is a necessity in ensuring sustainable library development.

**Research Question 6:** What are the challenges militating against the application of ICT for sustainable library development?

**Table 7:** Challenges against the application of ICT for sustainable library development.

Challenges	SA		A		D		SD		Mean
	No	%	No	%	No	%	No	%	
Poor internet connectivity	35	40.7	40	46.5	11	12.8	0	-	3.28
Lack of technology literacy	35	40.7	40	46.5	11	12.8	0	-	3.28
Lack of competency	35	40.7	40	46.5	11	12.8	0	-	3.28
Erratic power supply	32	37.2	45	52.3	9	10.5	0	-	2.7
Copyright and intellectual property rights management	35	40.7	38	44.2	13	5.1	0	-	2.36
Lack of technical ICT knowledge	34	39.7	41	47.7	10	11.6	2	2.3	2.36
It is costly	35	40.7	40	46.5	8	9.3	3	3.5	2.34
Poor funding	35	40.7	40	46.5	7	8.1	4	4.7	2.23
Insufficient bandwidth	3	37.2	42	48.8	10	11.6	2	2.3	2.23
Constant change of software and hardware	35	40.7	40	46.5	5	5.8	6	7	2.21

Table 7 reveals the challenges militating against the application of ICT in library operation. Majority of the respondents indicated that poor internet connectivity (Mean = 3.28) and lack of technology literacy (Mean = 3.28) affected the application of ICT in library operation. Other factors include: lack of competency (Mean = 3.28), erratic power supply (Mean = 3.27), copyright and

intellectual property rights management (Mean = 3.26), lack of technical ICT knowledge (Mean = 3.26), poor funding (Mean= 3.23), insufficient bandwidth (Mean = 3.21), and constant change of software and hardware (Mean = 3.21).

## 5. Testing of Hypotheses

### Hypothesis 1

#### Research Skills and Sustainable Library Development.

The hypothesis states that there is no significant relationship between research skills and sustainable library development in university libraries in South-west, Nigeria. To test the hypothesis, the data collected on research skills and sustainable library development were subjected to Pearson Product Moment Correlation Analysis. This is in Table 7.

**Table 7:** Correlation between research skills and sustainable library development in university libraries in South-west, Nigeria.

Variable		Research skill	Sustainable Library Development.
Research skill	Pearson Correlation	1	.252*
	Sig. (2-tailed)		.019
	N	86	86
Sustainable Library Development.	Pearson Correlation	.252*	1
	Sig. (2-tailed)	.019	
	N	86	86

\*. Correlation is significant at the 0.05 level (2-tailed).

It is revealed in the above table that a correlation of 0.252 exists between research skill and sustainable library development at 0.05 level ( $r = .252$ ,  $N = 86$ ,  $P < 0.05$ ). Since the significant value (Sig.2-tailed) is 0.019 (which is less than 0.05), it can therefore be concluded that there is significant relationship between research skill and sustainable library development in university libraries in South-west, Nigeria. The null hypothesis which says there is no significant relationship between research skill and sustainable library development is rejected. It means therefore that an increase in research skills libraries will lead to more sustainable development of the library.

### Hypothesis 2

#### ICT Application and Sustainable Library Development

The hypothesis states that there is no significant relationship between ICT application and sustainable library development in university libraries in South-west, Nigeria. To test the hypothesis, the data collected on research skills and sustainable library development were subjected to Pearson Product Moment Correlation Analysis. This is in Table 8.

**Table 8:** Correlation between ICT application and sustainable library development in university libraries in South-west, Nigeria.

Variable		Research skill	Sustainable Library Development.
ICT Application	Pearson Correlation	1	.235*
	Sig. (2-tailed)		.029
	N	86	86
Sustainable Library Development.	Pearson Correlation	.235*	1
	Sig. (2-tailed)	.029	
	N	86	86

Correlation is significant at the 0.05 level (2-tailed)

It is shown in the above table that a correlation of 0.235 exists between ICT application and sustainable library development at 0.05 level ( $r = .235$ ,  $N = 86$ ,  $P < 0.05$ ). Since the significant value (Sig.2-tailed) is 0.029 (which is less than 0.05), it can therefore be concluded that there is significant relationship between ICT application and sustainable library development in university libraries in South-west, Nigeria. It means therefore that an increase in ICT application in university libraries will lead to more sustainable development of the library.

### Hypothesis 3

#### Research skills, ICT application and sustainable library development

The hypothesis states that there is no joint influence of research skills and ICT application on sustainable library development. This is shown in Table 9.

**Table 9:** Joint influence of research skills and ICT application on sustainable library development

R	R Square	Adjusted R Square	Std. Error of the Estimate
.235	.055	.044	.612

#### ANOVA

Model	Sum of Squares	DF	Mean Square	F	Sig.	Remark
Regression	1.840	1	1.840	4.913	.029	
Residual	31.462	133	.375			
Total	33.302	141				

Table 9 shows the joint influence of research skills and ICT application on sustainable library development in South-west, Nigeria. The table also reveals a coefficient of multiple correlation ( $R = .235$  and a multiple  $R^2$  of 0.055). This indicates that 5.5% of the variance is accounted for by the five predictor variables when taken together. Test of significance was at  $P < 0.05$ . The analysis of variance (ANOVA) for the regression produced a F-ratio of 4.913 which is greater than the significant level of 0.05. This indicates that the joint influence of research skills and ICT application is not significant on sustainable library development.

## 6. Conclusion and Recommendation

The study investigated the relationship between research skills, ICT application and sustainable library development in South-west, Nigeria. Sustainable library development is very primary in educational aspect of 2030 Sustainable Development Goal Agenda of the United Nations. More so, library occupies a central position in the university system (Okenedo, et al, 2015). Descriptive survey research design was used for the study. Majority of the respondents were male. The highest population of the respondents was principal librarian. Most of the respondents were within the age range of 41-50. Majority of the librarians had spent between 11-20 years on the job. Also, the vast proportion of the respondents was master's degree holders.

The study revealed that the development of skills to evaluate more accurately the sources of information, development of skills to access digital platform for cultural heritage, and enhancement of scientific research through the development of research skills are very fundamental to sustainable library development. The study also revealed that through enhanced use of technology to promote education and ensuring public access to information and intellectual freedom, an optimal level of development in the libraries are achieved. The Sustainable Library Development Agenda of most institutions support strengthening libraries to advocate for equitable access to information, development of scholarly skills and preservation of indigenous knowledge.

In terms of the extent of research skills of librarians in university libraries for sustainable library development, the study revealed that high level of research skills is needed by librarians. These include problem solving skills, information dissemination skills, analytical skills, critical thinking skills, and computer/ICT skills. The study showed that highest impact of research skills was adjudged to be development of ability to exploit new topics in librarianship, followed by improved research productivity.

The extent of application of ICT in library operations was accepted as being high. Digitization of library resources maintained a lead, followed by library networking and resource sharing. This negates the position of Saleem, Shabana and Batcha (2013) who found library automation and library networking as having the highest level in terms of ICT application. The study revealed that ICT application in library operations facilitated resource sharing among libraries, accurate storage of information, and faster library work. Poor internet connectivity, lack of technology literacy, and lack of competency were recorded as the fundamental constraints to the application of ICT in library operations.

The null hypothesis (Ho1) which states that there is no significant relationship between research skills and sustainable library development was rejected. The result of the null hypothesis 2 (Ho2) tested using Pearson Product Moment Correlation Analysis revealed that the null hypothesis which stated that there is no significant relationship between ICT application and sustainable library development was rejected. The finding therefore suggested that the use of ICT is a significant factor that casually impacts on sustainable library development. It goes further to mean that the libraries that effectively utilize ICT may have high level of sustainable development.

The null hypothesis 3 (Ho3) which states that there is no significant relationship between joint influence of research skills and ICT application on sustainable library development, was accepted. ANOVA for the regression for the regression produced F-ratio of 4.913 which was greater than the significant level of 0.05 which led to the acceptance of the null hypothesis.

Based on the above findings and conclusion, the following recommendations are made:

1. Sustainable library development should be a joint agendum of all the library staff.
2. The librarians should maintain high level of research skills towards ensuring sustainable library development.
3. Regular training should be organized for the library on new trends in research towards improving their research skills and ICT use.
4. ICT should be applied to every facet of library operation.

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