

Information communication technology skills and research output of librarians in tertiary institutions in Osun State, Nigeria

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Abstract

This study examines the relationship between ICT skills and research productivity among librarians in tertiary institutions in Osun State, Nigeria. Utilizing a descriptive survey research design, data were collected from a population of 104 librarians through a structured questionnaire. The findings reveal that librarians possess high levels of ICT skills, particularly in hardware operation, internet usage, word processing, and data analysis. However, their research productivity remains low, with limited contributions to scholarly outputs. A Pearson correlation analysis indicated a positive but weak relationship between ICT skills and research productivity ($r = 0.22$, $p < 0.05$), while regression analysis demonstrated that ICT skills account for only 4.8% of the variance in research productivity. These results suggest that while ICT skills are necessary, they are not sufficient to drive significant research output. The study recommends capacity-building initiatives, improved access to ICT infrastructure, research mentorship, and institutional policies that incentivize scholarly engagement. Addressing barriers such as excessive workloads and lack of motivation is also critical. By fostering an enabling environment, tertiary institutions can enhance the research contributions of librarians, thereby advancing academic excellence. This study contributes to the discourse on professional development and productivity in academic libraries and underscores the need for holistic strategies to boost research output.

Keywords: ICT skills, academic librarianship, research productivity, information professionals, tertiary institutions, Osun State, Nigeria

Introduction

The users of a university library encompass students, lecturers, researchers, support staff, and members of the host community. The quality of academic output in a university is closely associated with the services provided by its librarians, who play a vital role in the academic ecosystem. Librarians curate learning materials for all existing courses within the university and anticipate the needs of potential future courses, ensuring the availability of resources necessary for effective learning and research (Aina, 2004).

Research productivity, as described by Anyaogu and Iyabo (2014), refers to the body of work published in various formats, including book chapters, co-authored textbooks, occasional papers, monographs, conference papers, scholarly journals, and international peer-reviewed journals. For university librarians, research productivity is

not only essential for advancing knowledge but also pivotal for career progression. Okonedo (2015) emphasizes that promotions and tenure for librarians are often contingent on their research contributions, paralleling the expectations placed on academic faculty. Research productivity in this context includes activities such as academic publishing, maintaining institutional repositories, facilitating open access, managing research data, and supporting digital scholarship. Additionally, librarians are increasingly involved in areas such as authors' rights, funding compliance, grant proposal writing, and promoting research integrity, reflecting the evolving scope of academic librarianship as a professional field.

University libraries have historically supported research, teaching, and learning within higher education institutions. However, the landscape of higher education

has undergone significant transformations, driven by changes in student learning approaches, evolving teaching methodologies, and the impact of globalization and internationalization on university culture (Barber & Rizvi, 2013). The development of information and communication technology (ICT) has further amplified these changes, profoundly influencing research processes and library operations. These technological advancements challenge and reshape traditional library practices, redefining the roles of library professionals (Pather, 2016).

In recent years, the information profession has experienced rapid and continuous changes, driven by the emergence of new technologies. Information professionals must adapt to these advancements, acquiring new skills and competencies to remain relevant. As Ashcroft (2004) observes, the profession is in a state of flux, with traditional roles evolving into new responsibilities that align with emerging ICTs. Nwakanma (2003) further highlights that information professionals are now expected to demonstrate proficiency in using and applying ICT tools.

The evolution of library environments over recent decades reflects significant changes in services, structure, and collections. Libraries have transitioned from predominantly physical collections to incorporating extensive electronic resources, both online and offline. The automation of library operations and the introduction of web-based services have redefined user engagement and reshaped library systems. These advancements are largely attributable to the growing adoption and application of ICT, which has also played a transformative role in broader societal contexts (Satpathy & Maharana, 2011).

The definition of information and communication technologies (ICTs) varies among authors and organizations. The European Commission's Digital Economy

and Society Index Report (2019) defines ICT as encompassing all devices, applications, networks, and systems that facilitate the access, storage, transmission, and manipulation of data. This comprehensive definition underscores the pervasive influence of ICT in modern society. Similarly, the United Nations Development Programme (UNDP) describes ICT as a diverse set of technological tools and resources for creating, managing, storing, and communicating information. These include the internet, wireless networks, and mobile phones, highlighting the transformative role of ICT in development (UNDP, 2019).

The introduction of ICT has revolutionized the traditional roles of academic librarians. Arumuru (2015) notes that 21st-century ICT advancements have enabled librarians to adopt enhanced roles such as search intermediaries, researchers, facilitators, internet access providers, information evaluators, collaborative system designers, end-user trainers, and knowledge managers. These roles have significantly improved the accuracy, efficiency, and delivery of library services. Furthermore, ICT enables the establishment of robust library infrastructures that are accessible to users irrespective of time or location constraints. These advancements have not only improved library operations but have also elevated the strategic importance of librarians in academic and research ecosystems. Therefore, this study explores the relationship between ICT skills and the research output of librarians within the context of Osun State, Nigeria, where these advancements and challenges manifest uniquely, reflecting the local academic and technological environment.

Objectives of the study

The main objective of the study is to investigate ICT skills and the research productivity of librarians in tertiary

institutions at Osun State. Specific objectives are to:

1. Ascertain the level of ICT skills of librarians in tertiary institutions in Osun State, Nigeria.
2. Explore the relative contribution of ICT on research productivity of librarians in tertiary institutions in Osun State, Nigeria.
3. Determine the relationship between ICT skills and research productivity of librarians in tertiary institutions in Osun State, Nigeria.
4. Investigate the influence of ICT skills on the research productivity of librarians in tertiary institutions in Osun State, Nigeria.

Research questions

The following questions are answered in the study:

1. What is the level of ICT skills of librarians in tertiary institutions in Osun State, Nigeria?
2. What is the relative contribution of ICT skills on the research productivity of librarians in tertiary institutions in Osun State, Nigeria?

Hypotheses

The following hypotheses are tested at 0.05 level of significance in the study:

HO₁: There is no significant relationship between ICT skills and research productivity of librarians in tertiary institutions in Osun State, Nigeria.

HO₂: There is no significant influence of ICT on the research productivity of librarians in tertiary institutions in Osun State, Nigeria.

Literature review

The expansion of library collections during the late 19th and early 20th centuries fostered a competitive ethos among libraries, with emphasis placed on the size and perceived

value of their collections (Weiner, 2005). During this period, libraries became central repositories of knowledge, symbolizing institutional prestige and academic excellence. However, the evolution of libraries was not merely about the expansion of collections; it reflected broader societal and technological changes. Following World War II, the surge in scholarly output, driven by increased global collaboration and the proliferation of higher education institutions, brought about significant challenges in managing and disseminating knowledge. The advent of computing technologies during this era revolutionized library systems, introducing new methods for cataloging, organizing, and retrieving information efficiently (Gilmour & Sapp, 2002). These technological advancements equipped librarians with powerful tools but also raised existential concerns about the relevance of traditional library roles in an increasingly automated environment.

By the mid-1980s, it became evident that the traditional model of information control and dissemination was undergoing profound transformation. Librarians faced mounting pressure to adapt to the changing landscape, which demanded new competencies and innovative approaches to remain relevant in the information ecosystem (Gilmour & Sapp, 2002). The advent of the digital era brought further challenges and opportunities. Scholarly publications increasingly migrated to electronic platforms, necessitating significant adaptations in library services and practices. Librarians were called upon to adopt value-added roles, such as designing seamless information architectures, managing knowledge systems, and curating digital content, to assist users in navigating the vast and often unregulated digital landscape (Gilmour & Sapp, 2003). These changes underscored the critical need for librarians to redefine their roles continuously, ensuring that they could meet the evolving demands of their users.

Research productivity has emerged as a fundamental aspect of academic librarianship. It is often measured through various scholarly outputs, including journal articles, conference proceedings, monographs, and other professional publications (Garner et al., 2018). Sarah (2015) highlights the diversity of these outputs, emphasizing the importance of collaborative projects, editorial responsibilities, and public engagement activities. Research productivity is not merely a professional benchmark but also a critical component of institutional reputation and competitiveness. As Herman and Nicholas (2019) note, the scholarly contributions of librarians significantly influence the academic standing of their institutions. In many regions, including Canada and the United States, research output plays a pivotal role in determining eligibility for tenure and promotion. This trend is increasingly mirrored globally, where practitioner-led research is gaining recognition as a vital bridge between theoretical inquiry and practical application (Sassen & Wahl, 2014; Withorn et al., 2021).

The integration of information and communication technology (ICT) into library operations has profoundly transformed the field of librarianship. ICT tools have enabled librarians to manage digital repositories, streamline workflows, and enhance the accessibility of resources, thereby improving service delivery and user satisfaction (Aina, 2004; Ince et al., 2019). Modern libraries, often described as "libraries without walls," leverage technology to provide users with access to resources anytime and anywhere. This shift has been particularly beneficial in meeting the needs of tech-savvy patrons who expect seamless access to information across multiple platforms (Jain, 2013; Sanni, 2015). Moreover, the use of ICT and social media platforms has extended the reach of library services beyond physical spaces, fostering

greater user engagement and interaction (Oyeniran & Olajide, 2019).

Cataloging practices have also evolved significantly with the integration of ICT. Traditional cataloging methods have been augmented by systems adhering to AACR norms within MARC21 frameworks. The adoption of Online Public Access Catalogs (OPACs) exemplifies how technology has revolutionized access to library resources, making them more efficient and user-friendly (Saha et al., n.d.). These advancements underscore the transformative impact of ICT on library operations, highlighting the need for librarians to continuously update their skills and knowledge to stay abreast of technological developments.

Empirical studies provide valuable insights into the impact of ICT on librarianship. For instance, Oyovwe-Tinuoye et.al. (2021) examined the computer skills of librarians in Nigeria and found improvements over previous studies but noted persistent deficiencies in critical areas. Similarly, Ansari (2013) investigated the ICT proficiency of library professionals in universities in Karachi, Pakistan. The study revealed varying levels of competency across different ICT domains, with most professionals reporting moderate proficiency. These findings underscore the need for targeted training programs to address specific skill gaps and enhance overall ICT proficiency among librarians.

Lawal and Olawale's (2020) study on the impact of ICT on research productivity at Bowen University Library provides further evidence of the transformative potential of technology. Using a questionnaire-based survey of 10 librarians, the study found that while overall research productivity was low, ICT tools had notable impacts on data gathering, collaborative research, and the quality and quantity of literature searches and data analysis. These findings highlight the

critical role of ICT in facilitating research activities and improving scholarly output.

In another study, Dahiru et al. (2019) explored the application of ICT in acquiring information resources across selected university libraries in northwest Nigeria. The study aimed to examine the influence of performance expectancy, effort expectancy, social influence, and facilitating conditions on librarians' intention to use ICT for acquisition. Using a questionnaire administered to 224 librarians, the study found strong support for the use of ICT in library operations. The findings also revealed that while librarians possessed the necessary knowledge to use ICT effectively, training programs often focused on general ICT usage rather than specific applications, such as acquisition. This underscores the need for more specialized training to maximize the benefits of ICT integration.

Despite these advancements, challenges remain. Oyovwe-Tinuoye et al. (2021) lamented that reports of low ICT literacy among Nigerian librarians persist, highlighting the need for continuous skill development. The inability of some librarians to effectively utilize ICT tools limits their capacity to deliver high-quality services and meet the demands of modern library users. Addressing these challenges requires sustained investment in training and professional development programs, as well as a commitment to fostering a culture of innovation and adaptability within the profession.

Publishing remains a core principle of academic librarianship, serving as a critical benchmark for professional success and institutional recognition. The necessity to publish is integral to the identity of academic librarianship, reflecting its dual role as a profession and a scholarly discipline. To meet the demands of modern libraries, particularly academic ones, librarians must possess adequate ICT skills and a deep understanding of emerging technologies.

Continuous learning and skill development are essential for librarians to navigate the rapidly changing landscape of information technology and provide superior services to users (Connaway & Powell, 2017).

The literature underscores the intricate relationship between ICT advancements, research productivity, and the evolving roles of librarians. The adoption of ICT has not only transformed traditional library operations but also redefined the professional identity of librarians. By embracing new technologies and expanding their skill sets, librarians have the opportunity to enhance their contributions to the academic and professional communities they serve. This study situates itself within the context of Osun State, Nigeria, where unique challenges and opportunities in ICT adoption significantly shape academic librarianship. Understanding this dynamic is crucial for examining how ICT skills influence the research productivity of librarians in the region. Through this lens, the study seeks to contribute to the broader discourse on the role of technology in advancing the profession and fostering scholarly excellence.

Methods

This study adopted the descriptive survey research design to describe the relationship that exists between the identified variables in the study. The populations of this study are the 116 professional librarians in the selected tertiary institutions in Osun State, Nigeria. A total number of 116 copies of the questionnaire were distributed via Google form among librarians in the seventeen (17) tertiary institutions' libraries. The data collected for this study were analyzed using specific statistics used to analyze the data for answering the research questions as well as the one(s) used to test the hypotheses with the aid of Statistical Package for the Social Sciences (SPSS) 22. In the same way, the Pearson's Product Moment Correlation Coefficient statistical method used to test the

null hypotheses. The null hypotheses that were formulated for this study were tested at a 0.05 level of significance. Indicate the decision rule to interpret the mean scores.

Results

A total of 116 copies of the research instrument were administered to the respondents via google form to professional librarians in tertiary institutions in Osun State, out of which 104 (90%) was returned and found suitable for analysis.

Research question one: What is the level of ICT skills of librarians in tertiary institutions in Osun State, Nigeria?

This question is answered with the data in Table 1.

Table 1 shows the result of descriptive analysis of respondents to answer research question one: What is the level of ICT skills of librarians in tertiary institutions in Osun State, Nigeria? From the result of the findings, the mean and the standard deviation shows the level of ICT skill of the librarians in tertiary institutions in Osun State, Nigeria is high. This was shown with the total average mean score of (grand $\bar{x}$ = 3.39, SD=0.62). The result implied that all the respondents are ICT literate. The ICT skills was categorized

into 4 which are; proficiency in using hardware, proficiency in word processing/spreadsheet, proficiency in web-based functions and proficiency in data processing.

Research question two: What is the relative contribution of ICT skills on the research productivity of librarians in tertiary institutions in Osun State, Nigeria?

This question is answered with the data in Table 2.

Table 2 shows the result of descriptive analysis of respondents to answer research question two: What are the relative contributions of ICT skills on research productivity of Librarians in tertiary institutions in Osun State, Nigeria? From the result of the findings, the mean and the standard deviation shows that contributions of ICT skills on research productivity of librarians in tertiary institutions in Osun State, Nigeria is low. This was shown with the total average mean score of (Grand $\bar{x}$ = 2.0, SD=0.84). The result implied that all the respondents have low output in the area of research activities.

Hypothesis one: There is no significant relationship between ICT skills and research productivity of librarians in tertiary institutions in Osun State, Nigeria. The hypothesis was tested using a Pearson's Product Moment Correlation (PPMC) – Table 3. The analysis procedure involves pooling respondents' scores on each item measuring ICT skills to arrive at the composites scores; the same procedure was applied for research productivity of the librarians.

Table 1: Level of ICT skills of librarians in tertiary institutions in Osun State, Nigeria

Proficiency in using ICT hardware	VH	H	L	VL	N	Mean	SD	Decision
Operating a laptop	77(74%)	27(26%)	0	0	104	3.74	.441	Very High
Operating a multimedia device	50(48.1%)	54(51.9%)	0	0	104	3.48	.502	High
Operating a digital camera	31(29.8%)	40(38.5%)	32(30.8%)	1(1.0%)	104	2.97	.806	High
Operating a printer/scanner	60(57.7%)	35(33.7%)	9(8.7%)	0	104	3.49	.654	High
Operating a barcode reader	34(32.7%)	54(51.9%)	16(15.4%)	0	104	3.17	.675	High
Operating a CD-ROM	37(35.6%)	53(51%)	14(13.5%)	0	104	3.22	.668	High
Using a pointing device	29(27.9%)	57(54.8%)	18(17.3)	0	104	3.11	.667	High
Proficiency in word processing/spreadsheet								
creating documents	87(83.7%)	17(16.3%)	0	0	104	3.84	.372	Very High
formatting printing and deleting a document	71(68.3%)	29(27.9%)	4(3.8%)	0	104	3.64	.556	Very High
Creating a power point presentation	66(63.5%)	32(30.8%)	6(5.8%)	0	104	3.58	.602	Very High
Saving documents	78(75%)	26(25%)		0	104	3.75	.435	Very High
Creating slides/presentation	63(60.6%)	39(37.5%)	2(1.9%)	0	104	3.59	.533	Very High
Creating spreadsheet document	55(52.9%)	41(39.4%)	8(7.7%)	0	104	3.45	.637	High
Creating graphs, charts, pictures etc.	41(39.4%)	39(37.5%)	24(23.1%)	0	104	3.16	.777	High
Proficiency in Internet operation								
sending and receive voice mail	79(76%)	18(17.3%)	7(6.7%)	0	104	3.69	.592	Very High
Operating e-conferencing services	39(37.5%)	55(52.9%)	10(9.6%)	0	104	3.28	.630	High
Chatting in web discussion groups	48(46.2%)	41(39.4%)	15(14.1%)	0	104	3.32	.714	High
Accessing and downloading e-information services	60(57.7%)	37(35.6%)	7(6.7%)	0	104	3.51	.623	Very High
Using search engines to find information	72(69.2%)	29(27.9%)	3(2.9%)	0	104	3.66	.533	Very High
Searching for information on the web	74(71.2%)	30(28.8%)	0	0	104	3.71	.455	Very High
Browsing and downloading files from Internet	85(81.7%)	19(18.3%)	0	0	104	3.82	.388	Very High
Proficiency in data processing								
entering and editing data	57(54.8%)	40(38.5%)	7(6.7%)	2	104	3.48	.623	High
Sorting of data into sequence	40(38.5%)	50(48.1%)	9(8.7%)	5(4.8%)	104	3.15	.943	High
Interpreting the result of data analysis	25(24%)	44(42.3%)	29(27.9%)	6(5.8%)	104	2.79	1.002	High
collecting and storage of data	47(45.2%)	44(42.3%)	7(6.7%)	6(5.8%)	104	3.21	1.002	High
Operating data processing software (spreadsheet)	33(31.7%)	51(49%)	14(13.5%)	6(5.8%)	104	3.01	.990	High
Chatting in a web discussion	40(38.5%)	47(45.2%)	17(16.3%)	0	104	3.22	.710	High
Classifying data into groups	30(28.2%)	51(49%)	18(17.3%)	5(4.8%)	104	2.97	.950	High
Grand $\bar{x}$						3.39	0.62	High

Key: VH – Very High, H – High, L – Low, VL – Very Low

Decision rule: 3.50 – 4.00 = Very High, 2.50 – 3.49 = High, 1.50 – 2.49 = Low, 1.00 – 1.49 = Very Low

Table 2: Contribution of ICT skills on research productivity of the librarians

Research productivity of librarians	Never	1-2	3-4	5-6	Above 6	N	Mean	SD	Decision
Chapter contribution in books	32(30.8%)	66(63.5%)	5(4.8%)	1(1.0%)	0(0%)	104	1.76	.583	Very Low
Co-authored books	22(21.2%)	63(60.6%)	7(6.7%)	6(5.8%)	6(5.8%)	104	2.14	1.009	Low
Articles in journals	7(6.7%)	47(45.2%)	30(28%)	10(9.6%)	10(9.6%)	104	2.70	1.060	Moderate
Edited and translated books	43(41.3%)	57(54.8%)	4(3.8%)	0(0%)	0(0%)	104	1.63	.561	Low
Paper presentation at seminars, conferences and workshops	24(23.1%)	48(65.4%)	18(17%)	7(6.7%)	7(6.7%)	104	2.28	1.101	
Monographs	40(38.5%)	53(51.0%)	8(7.7%)	3(2.9%)	0(0%)	104	1.78	.824	1-2
Technical reports	31(29.8%)	61(58.7%)	5(4.8%)	7(6.7%)	0(0%)	104	.88	.780	1-2
Grand $\bar{x}$							2.0	0.84	1-2

Key to options (frequency of research output): Never – No research output recorded, 1–2 – Produced 1 to 2 research outputs, 3–4 – Produced 3 to 4 research outputs, 5–6 – Produced 5 to 6 research outputs, Above 6 – Produced more than 6 research outputs

Decision rule: 1.00 – 1.49 = Very Low Research Productivity, 1.50 – 2.49 = Low Research Productivity, 2.50 – 3.49 = Moderate Research Productivity, 3.50 – 4.00 = High Research Productivity

Table 3: PPMC of ICT skills and research productivity of the librarians

Variables	N	Means	SD	r.-value	P	Remark
ICT Skills	104	95.02	11.19	.243**	0.013	Sig.
Research productivity of Librarians	104	14.17	3.81			

The mean of the librarians' ICT skills in tertiary institutions in Osun State, Nigeria was 95.02, while that of research productivity of the librarians was 14.17. The correlation coefficient obtained was 0.243 with p-value <0.05. The result showed positive correlation between librarians' ICT skills and research productivity of the librarians in tertiary institutions in Osun State, Nigeria. There was a positive significant relationship between the variables as indicated in the above table as (r=0.243, N=104, P<0.05). Hence, null hypothesis one is rejected. This indicates that there is significant relationship between Librarians' ICT skills and research productivity of librarians in tertiary institutions in Osun State, Nigeria.

Hypothesis two: There is no significant influence of ICT skills on research productivity of librarians in tertiary institutions in Osun State, Nigeria.

This hypothesis was tested by employing multiple regressions. The analysis procedure involved regressing ICT skills on research productivity.

Table 4 shows that the contribution of the independent variable (ICT skills) on research productivity in tertiary institutions in Osun State, Nigeria was significant. The table also shows that the analysis of variance (ANOVA) for the regression yielded an F-value of 3.639 (P<0.05 level). This implies that the influence of the independent variable on the dependent variable was significant. This indicates that ICT skills have a significant influence on research productivity of librarians in tertiary institutions in Osun State, Nigeria.

Besides, the table also reveals a coefficient of multiple correlation R=0.259, coefficient of $R^2=0.267$ and adjusted $R^2=0.249$. The model implies that ICT skills account for 24.9% change of variation in research productivity of librarians in tertiary institutions in Osun State, Nigeria. These

were attributed to an increase in ICT skills. In other words, 24.9% of variability in conformity to research productivity by librarians is explained by ICT skills of the librarians. The remaining 75.1% as observed here may be due to other factors influencing the research productivity of Librarians in tertiary institutions in Osun State, Nigeria.

Consequently, the null hypothesis that, there is no significant influence of ICT skills on research productivity of librarians in tertiary institutions in Osun State, Nigeria is therefore rejected. In terms of magnitude, the result also shows ICT skills contributed to the research productivity of librarians in tertiary institutions in Osun State, Nigeria ($\beta=0.218$; $P<0.05$).

Table 4: Multiple regression analysis of ICT skills on research productivity

Coefficients ^a						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.044	3.959		1.022	309
	ICT skills	.213	.039	.218	1.638	.104
a. Dependent Variable: research productivity						
Testing for significant influence of ICT Skills on research productivity						
ANOVA ^a						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	100.356	2	50.178	3.639	.030 ^b
	Residual	1392.529	101	13.787		
	Total	1492.885	103			
a. Dependent Variable: research productivity						
b. Predictor: (Constant), ICT Skills						
R = 0.259						
R ² = 0.267						
Adjusted R Square = 0.249						

Conclusion

The study investigated the ICT skills and research productivity of librarians in tertiary institutions in Osun State, Nigeria. Findings revealed that the librarians possess a high level of ICT skills across hardware usage, word processing, internet operations, and data processing. However, their research productivity remains low, with limited contributions in book chapters, co-authored books, journal articles, conference presentations, and other scholarly outputs. This indicates a significant gap between the potential facilitated by ICT skills and actual research productivity outcomes.

The study found a positive and significant relationship between ICT skills and research productivity ($r=0.243$, $p<0.05$), highlighting the role of ICT in enhancing

research outputs. Despite this relationship, the regression analysis revealed that ICT skills alone do not exert a substantial influence on research productivity, suggesting that other factors might mediate or moderate this relationship. These findings emphasize the importance of leveraging ICT skills not only for routine library operations but also for advancing scholarly contributions. The study highlights the need for institutional frameworks that support the translation of ICT competencies into tangible research outputs.

Based on the findings of this study, which examined the ICT skills and research productivity of librarians in tertiary institutions in Osun State, Nigeria, it is evident that while librarians possess a high level of ICT skills, their research productivity

remains low. Furthermore, the study established a significant relationship between ICT skills and research productivity, but ICT skills alone do not have a substantial influence on research output. Therefore, it is essential to implement strategic measures that will enhance the effective utilization of ICT skills to improve research productivity. The following recommendations are proposed:

Strengthening ICT training and capacity building is crucial in addressing the gap between ICT proficiency and research productivity. Given that librarians already possess a high level of ICT proficiency; institutions should provide targeted training programs focused on utilizing ICT for research purposes. These programs should emphasize the use of ICT tools for literature searches, data analysis, reference management, and academic publishing. Training on emerging digital research tools such as plagiarism detection software, bibliometric analysis, and artificial intelligence-assisted research should also be incorporated.

Institutional support for research engagement is necessary to bridge the gap between ICT proficiency and research productivity. Tertiary institutions should establish mechanisms to encourage and support librarians in research activities. These mechanisms may include dedicated research grants and funding opportunities for librarians to conduct and publish research. Establishing research mentorship programs where experienced researchers guide librarians in research development will also be beneficial.

Enhancing access to digital research resources is another essential step in improving research productivity. One of the critical factors affecting research productivity is access to relevant academic resources. Institutions should subscribe to high-impact academic databases and journals that support research activities. Providing

librarians with access to digital libraries, open-access repositories, and institutional research databases will further facilitate scholarly work.

Encouraging collaborative research and networking plays a significant role in improving research output. Collaboration fosters a research culture among librarians and provides opportunities for joint publications and knowledge sharing. Institutions should promote interdisciplinary and inter-institutional research collaborations. Creating platforms for knowledge exchange will further strengthen research engagement and productivity.

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