Determinants of Effective Research Information Retrieval among Nigerian Librarians: The Roles of ICT Competencies, Web Competencies, and Web Search Strategies

Qudus Ajibola Bankole*, Kabiru Gambari Sulaiman**,
Abdulfatai Saliu***, Sulyman Olaitan Mahammuod****

ARTICLE INFO

ABSTRACT

The role of librarians has evolved beyond traditional bookkeeping and cataloging to include dynamic responsibilities in research information retrieval. This study examined the determinants influencing effective research information retrieval among Nigerian librarians, specifically focusing on ICT competencies, web competencies, and web search strategies. A descriptive survey was conducted, sampling 112 librarians from eight universities using questionnaires as the data collection instrument. The findings revealed that all three determinants—ICT competencies, web competencies, and web search strategies—were positively correlated with librarians' effective information retrieval for research in university libraries. Among them, web search strategies had the most significant impact, while web competencies had the least. Additionally, the combined influence of these determinants accounted for 68% of librarians' effective information retrieval for research. A multiple regression analysis was performed, yielding an F-ratio value of 37.85, which was significant at the 0.05 level. This underscores the importance of these determinants in shaping the effectiveness of information retrieval practices among librarians in university libraries.

1. Introduction

In today's digital age, the role of librarians has transcended beyond traditional bookkeeping and cataloging to encompass more dynamic responsibilities, especially in the realm of research information retrieval. With the advent of Information and Communication Technologies (ICTs) and the proliferation

* Research Officer, Kwara State Internal Revenue Service, Ilorin, Nigeria (ajibolabankole01@gmail.com) (Frist Author, Corresponding Author)
** Librarian II, Kwara State Library Board, Ilorin, Nigeria (skgambari09@gmail.com) (Co-Author)
*** Assistant Librarian, Afe Babalola University, Ado Ekiti, Nigeria (saliu.abdulfatai025@gmail.com) (Co-Author)
**** Lecturer III, Department of Library and Information Science, Federal Polytechnic Offa, Offa, Nigeria (mahammuod@gmail.com) (Co-Author)
International Journal of Knowledge Content Development & Technology

of online resources, the landscape of information retrieval has evolved significantly, presenting both challenges and opportunities for librarians. Effective research information retrieval involves the process of finding and accessing relevant information that can be used to support research activities. To effectively retrieve relevant information for research, it is necessary to define the research topic, choose appropriate search terms, use appropriate search tools, refine search results, evaluate the information's reliability and relevance, and finally, organize and manage the retrieved information (Zhang & Yang, 2022). Librarians play a vital role in facilitating access to research information for their patrons, and their ability to retrieve relevant information in a timely and effective manner is crucial to their success in this role.

The importance of information grows when it is applied effectively. However, many users lack familiarity with information retrieval tools, especially in developing nations. Studies by Pavani and Veerla (2019), Afebende and Nna-Etuk (2019), Obat (2019), Nneka, Obiora, and Juliet (2014), and Madu, Vandi, and Chagwa (2018) have highlighted this issue. These studies emphasize the urgent need for modern search strategies and enhanced ICT skills among librarians to bridge this gap. This underscores the need for contemporary search strategies and improved ICT skills among librarians.

Some key factors that can impact librarians' ability to effectively retrieve research information are their levels of ICT competencies, web competencies, and web search strategies. ICT competencies refer to the skills and knowledge required to use information and communication technologies effectively, including software applications, digital media, and the internet (Hussain & Nayab, 2021; Omehia et al., 2021). Also, it refer to the ability of librarians to effectively navigate and utilize various information and communication technologies in their daily tasks. This includes proficiency in using library management systems, databases, digital archives, and other digital tools that facilitate information retrieval. Librarians with higher levels of ICT competencies are better equipped to navigate and use various digital tools and resources to locate and retrieve relevant research information (Bajpai & Madhusudhan, 2019).

Web competencies, on the other hand, refer specifically to the skills and knowledge required to navigate and use the web effectively, including understanding web design, search engine optimization, and web-based applications (Oyieke & Dick, 2017). In an era where a vast majority of research materials are available online, librarians must possess the skills to identify credible sources, evaluate the reliability of information, and navigate various web platforms efficiently. Web competencies enable librarians to guide researchers and students in accessing and utilizing online resources that are pertinent to their academic and research needs. Having greater web competencies allows librarians to effectively navigate online resources and locate pertinent research information. Additionally, effective web search strategies, such as using appropriate search terms, understanding search algorithms, and utilizing advanced search techniques, are critical for efficient and successful research information retrieval (Tella, 2011; Afebende, 2019).

Information retrieval involves selecting relevant information sources from a variety of sources to satisfy a specific research information need, which can be done using full-text indexing or content-based indexing. It also involves finding information within documents and databases containing texts, pictures, sounds, or metadata, and automated information retrieval techniques are used to

reduce information overload. Afebende (2019) highlights that libraries play an important role in meeting the information needs of their users by acquiring, organizing, and preserving a variety of resources. However, with the increasing complexity of the information environment due to the development and use of ICTs and the widening variety of informational formats and contents, information access has become more challenging. It was found that libraries lack the necessary tools to effectively search for information resources, which makes it difficult for users to efficiently navigate and use library resources. To address this issue, there is a need for better information literacy and related technological skills among library users. Academic librarians should possess the necessary IT skills and knowledge to provide electronic services and teach information literacy skills to their users.

Ayoku and Okafor (2015) emphasized that most librarians in Nigeria have insufficient IT skills, and that the future of academic libraries will largely depend on the IT proficiency of their librarians. Thus, to effectively operate in the current technological and digital era, librarians must possess extensive IT knowledge and skills. Cheng and Chau (2016) stressed the importance of developing professional ICT competencies through a curriculum tailored for librarians. They highlighted that ICT skills are crucial for librarians to succeed in their profession. More so, Ojiegbe (2010) revealed that library staffs in Nigeria mostly learn ICT skills through self-practice, as library schools lack the necessary facilities to teach these competencies. Additionally, leaders' unwillingness to provide funding, hire additional staff, and grant study leave hinders library employees from attending ICT competency training.

Information retrieval systems are widely used in universities and libraries to provide access to books, journals, and other publications, with web search engines being the most common. Tsai, Liang, Hou, and Tsai (2012) found that users who utilize the internet to find research information have better attitudes and abstract comparisons. Onuoha, Akidi, and Chukwueke (2019) emphasized the importance of ICTs and ICT skills in society, including in library services, while also highlighting the significance of information management and email expertise, and the authors also found that users have developed various ICT skills, including web 2.0 and information retrieval competences. Doyle (2019) also identified several competences that librarians need, such as web search, digital marketing, and online collaboration.

Web search strategies encompass the systematic approaches and techniques employed by librarians to retrieve information from the web. This includes employing advanced search operators, utilizing specialized databases, employing citation tracking, and leveraging other search techniques to optimize the retrieval of relevant and reliable information. Effective web search strategies enable librarians to assist researchers in finding the most pertinent and valuable resources, thereby enhancing the quality and depth of research outputs. Effective web search strategies are critical for efficient and successful research information retrieval. Effective search strategies involve using appropriate search terms and keywords, understanding search algorithms and how they work, and using advanced search techniques to narrow down search results (Tella, 2011; Afebende, 2019).

The University of Johannesburg Library (2020) states that in order to locate the necessary research resources, such as library catalogs and online databases, individuals must utilize search strategies that involve the use of research terms and search methodologies. Search terms alone are not enough

to produce effective search results. The most commonly used search techniques by internet users include Truncation, Parentheses, Field Searching, Phrase Searching, Wildcards, and Boolean Logic. Tella et al. (2017) conducted a study that found that certain factors, such as search engines, Boolean search operators, and emotional intelligence, have a significant impact on the effectiveness of information retrieval. Tella (2011) also found that factors like emotional intelligence, membership in online discussion forums, and internet and computer self-efficacy significantly impact the effectiveness of users' web searches. Nyemezu et al. (2021) found that most online search engines, except Bing, Yahoo, Google Scholar, and Google, tend to have poor performance, with Google being the most extensively used by users.

Baro, Obaro, and Aduba (2019) highlight the challenges faced by librarians in acquiring digital literacy skills, such as a lack of funds for training and a shortage of equipment and skilled instructors. The librarians also reported moderate levels of digital literacy skills, with disparities among those sampled. To address these issues, Okehie, Nnadieto, Obiano, and Ogonna (2022) recommend that universities provide on-the-job ICT training for librarians and monitor their use of ICT to ensure compliance with international standards.

While the adoption of ICTs and web-based resources has expanded the scope of available information, it has also necessitated librarians to acquire new competencies and skills to remain relevant and effective in their roles. However, there is limited empirical research that explores the determinants of effective research information retrieval among Nigerian librarians, particularly focusing on the roles of ICT competencies, web competencies, and web search strategies. Understanding these determinants is crucial as it provides insights into the areas where capacity-building initiatives and training programs can be targeted to enhance librarians' capabilities in information retrieval. Moreover, identifying the key factors that influence effective research information retrieval can inform policy formulation, curriculum development, and strategic planning aimed at optimizing library services and supporting research excellence in Nigeria.

1.1 Statement of the problem

The use of information and communication technology (ICT) in libraries has been shown to enhance service delivery. However, some university library employees in Nigeria do not fully utilize available ICT resources, and it is unclear if librarians possess the necessary skills to run ICT facilities effectively. Despite the benefits of using the internet for research information, there is a lack of research on the web search tactics used by librarians in Nigeria to retrieve research information effectively. Furthermore, studies on research information retrieval effectiveness among librarians are limited, and have focused mainly on improving users' information retrieval and search capabilities. As a result, there is a gap in knowledge regarding the role of ICT competencies, web competencies, and search strategies in predicting the effectiveness of research information retrieval among librarians in Nigeria. This study aims to address this gap by investigating these factors as determinants of effective research information retrieval among Nigerian librarians.

1.2 Objectives of the study

Determinants of effective research information retrieval among Nigerian librarians: The roles of ICT competencies, web competencies, and web search strategies

1.3 Hypotheses

(1) ICT competencies of librarians significantly correlate with effective research information retrieval on the web in Nigeria.
(2) The web competencies of librarians significantly correlate with effective research information retrieval on the web in Nigeria.
(3) Web search strategies of librarians significantly correlate with effective research information retrieval in Nigeria.
(4) ICT competencies, web competencies and web search strategies of librarians will significantly determine effective research information retrieval in Nigeria

2. Literature review

2.1 ICT competencies and Librarians

ICT competencies for librarians refer to the relevant skills needed to utilize digital information search, access, and delivery to the fullest extent possible. These competencies involve acquiring the necessary knowledge and skills for carrying out tasks in a professional manner in the workplace (Oyedokun et al., 2018). Competencies in information and communication technologies are vital for meeting the operational requirements placed on individuals working in educational institutions (Jabbarova, 2020). Oyedokun et al. (2018) distinguished ICT skills into three levels: lower-level, moderate, and high-level ICT abilities. They found that a high percentage of users possess lower-level ICT skills. This suggests that librarians' effective performance depends on their proficiency in ICT competencies (Omehia, Okwu, & Nsirim, 2021).

ICT competencies play a special role in carrying out organizational processes at work (Murawski & Bick, 2017). They enable librarians to make strategic decisions (Chae et al., 2018) and provide library services in a free, accurate, and quick manner (Ahmad et al., 2020). The deployment of technologies such as barcode systems, library automation software, and OPAC has been crucial in transforming libraries, highlighting the need for ongoing training to function effectively in the digital age (Ahmad et al., 2020). Olatoye, Nekhwevha, and Muchaonyerwa (2021) revealed that users' ICT proficiency and experience with using electronic resources are typically low, which can limit their productive use of e-resources. Shastri and Chudasma (2022) found that while COVID-19 improved the use of library websites and electronic resources, challenges such as lack of ICT expertise, internet connectivity, and IT infrastructure hindered their effective utilization.

Studies have assessed the ICT competency levels of librarians. Ademodi and Adepoju (2019) found that 87.5% of librarians were computer proficient, with the ability to browse and explore

the internet being the most frequently mentioned skill. Omehia, Okwu, and Nsirim (2021) concluded that librarians must be proficient in technological tools for effective information resource management, leading to improved processing, collection, dissemination, selection, and arrangement. Ashraf, Iqbal, Arif, and Asghar (2022) found that participants in blended learning courses exhibited correlated ICT competencies with curriculum content, materials, and teaching methodologies. Their results suggest that instructional methods directly and significantly influence individuals' ICT competencies.

Hussain and Nayab (2021) discovered that most respondents possessed knowledge and skills in using various application software, including Photoshop, InPage, Microsoft Office Suite, wikis, social media, e-journal searching, webpage design, email communication, and search engines. Amua-Sekyi and Asare (2016) found that lecturers possess ICT skills such as internet access, word processing, database searching, presentation delivery, and email communication, emphasizing the importance of online information-seeking to connect with global education. Despite the availability of ICT resources, studies have identified challenges and barriers to their effective utilization. Madu, Vandi, and Chagwa (2018) noted low utilization of various ICT capabilities (computers, CD-ROMs, internet, and email) in the Ramat Library at the University of Maiduguri, citing poor ICT compliance, reliance on mobile devices, and attitudes toward ICT as potential factors. Network connectivity and power supply issues were also highlighted as obstacles (Madu, Vandi, & Chagwa, 2018; Rana & Bhatti, 2020).

To address the gaps in ICT competencies, researchers have emphasized the importance of revising the Library and Information Science (LIS) curriculum, allocating sufficient funds for information infrastructure upgrades, and providing training opportunities for LIS professionals (Oyedokun et al., 2018). Suggestions include encouraging staff members with advanced ICT skills to teach others, scheduling seminars and workshops regularly (Oyedokun et al., 2018), and establishing online training courses to instruct and direct users in the use of e-resources (Shastri & Chudasma, 2022). Despite the recognized need for ICT skill development, studies have identified challenges faced by professionals. Kaltimani and Naik (2013) found that library staff across different designations exhibited significant differences in various ICT skills, such as computer operation, file and folder creation, RFID, library automation software modules, web skills, website design and internet editing, web search, and digitization of information retrieval materials. Additionally, they highlighted that professionals often face financial constraints, excessive workload, and negative perceptions from managers when attempting to learn ICT skills.

2.2 Web competencies and Librarians

The internet has transformed the landscape of information access and retrieval, providing a vast realm of knowledge for learners and researchers (Borca et al., 2015; Kroustallaki et al., 2015; Tsai, Hsu, & Tsai, 2012). It offers a wealth of diverse information, enabling individuals to search for information related to their interests and obtain current updates (Tsai et al., 2012). However, the abundance of information on the internet has also created challenges for users in locating, retrieving, and evaluating authentic and relevant information (Al-Aufi, Al-Azri, & Al-Hadi, 2017; Sales, Pinto, & Fernández-Ramos, 2018).Librarians, as information professionals, play a crucial role in effectively

utilizing the internet for research and information retrieval. However, several studies have highlighted the challenges and competencies required for librarians to exploit the internet's potential fully.

Thanuskodi (2019) emphasized that using the internet for information retrieval requires not only literacy skills but also problem-solving abilities. The study found that LIS professionals use the internet to search for information for research papers, but face obstacles such as poor power supply, slow internet connections, and lack of computer literacy. Kankam and Nsibirwa (2019) stressed the need for information users, including librarians, to be competent and skilled in effectively obtaining online information on the web. Malliari et al. (2014) revealed that individuals have limited options for accessing the internet, and the online infrastructure at the colleges surveyed was insufficient, with inadequate workstations and labs to accommodate regular internet use.

Uwaifo (2013) identified several factors hindering librarians' effective use of the internet, including lack of resources, inadequate localized software, lack of a workable government policy on ICT use, political instability, and lack of ICT skills. Despite the availability of many information resources on the internet, only a small number are fully utilized by librarians due to their average internet usage abilities. To address these challenges, librarians need to develop and enhance their web competencies, which encompass a range of skills and knowledge. These competencies include:

(1) Information literacy skills: The ability to locate, evaluate, and use information effectively from the vast array of online resources (Sales et al., 2018; Thanuskodi, 2019).
(2) Technical skills: Proficiency in using computers, navigating the internet, and utilizing various search engines and databases effectively (Uwaifo, 2013).
(3) Critical thinking and problem-solving abilities: The ability to analyze and synthesize information from multiple sources, identify reliable and authentic information, and address challenges related to information retrieval (Thanuskodi, 2019).
(4) Adaptability and continuous learning: The willingness to adapt to the rapidly evolving digital landscape and engage in continuous professional development to stay updated with the latest technologies and best practices (Uwaifo, 2013).
(5) Collaboration and networking: The ability to collaborate with colleagues, researchers, and other stakeholders to share knowledge, resources, and best practices related to web-based information retrieval (Kankam & Nsibirwa, 2019).

By developing and fostering these web competencies, librarians can overcome the challenges posed by the vast and dynamic online information environment, and effectively support research and knowledge creation through efficient and reliable information retrieval from the internet.

2.3 Web Search Strategies, Librarians and Research Information Retrieval Effectiveness

Internet search is typically conducted as part of an ongoing search for new and improved information on a particular subject (Thanuskodi, 2019). Web searching is a dynamic activity that evolves rapidly over a short period (Kroustallaki et al., 2015). Effective online information searching requires competencies that enable users to identify and organize an information need by recognizing essential

terms and concepts defining the search profile. Additionally, it teaches individuals how to handle "strategies, tactics, and tools for constructing the search and selecting appropriate resources" and determine if the needed information is available and beneficial (Sales, Pinto, & Fernández-Ramos, 2018). Studies by Aula, Khan, and Guan (2010), Nkomo et al. (2011), Dempsey and Valenti (2016), and Leeder and Shah (2016) emphasized that while most respondents claimed to have the knowledge and skills to access online content, their actual strategies demonstrated a lack of skills for conducting efficient web searches. Respondents overrelied on keyword searching at the expense of more advanced techniques, indicating a lack of knowledge and expertise required for effective search strategies.

To improve search abilities, the studies recommended educating people in advanced search strategies like Google Advanced Search. Pavani and Veerla (2019) noted that online search systems are characterized by features like information coverage and sources, indexing mechanisms, vocabulary management, searching tools, ranking strategies, and search refinements. Adomi (2012) found users employ various search strategies reflecting their literacy and education levels, emphasizing that understanding search strategies can improve efficient use of necessary information sources. Information literacy equips users with skills and methods to locate, retrieve, and utilize appropriate offline and online sources, motivating successful searching and resource use (Akanbi, Ajani, & Bankole, 2021).

Research on web browsing habits focuses on implicit strategies (asking users to reflect on patterns via questionnaires/interviews) and explicit strategies (directly recording user activities through observation and transaction logs) (Tsai, Hsu, & Tsai, 2012). Effective web searching involves skills like understanding the subject, scope, thoroughness/precision needed, appropriate language, document types, and search tools (Sales, Pinto, & Fernández-Ramos, 2018). Nyemezu, Edeh, Edereka, and Ugwu (2021) proposed enhancing internet search engine use by providing high connectivity, tech-driven management, high data transfer, adequate telecom infrastructure, and subsidizing computers/smartphones. Koesten, Kacprzak, and Tennison (2016) found people lacked necessary skills for proper internet searching.

Mamza and Waba (2021) revealed academic staff lack proficiency in web search strategies despite frequently using field and phrase searching. Obstacles included lack of search tactic knowledge, ICT literacy, and network access. They recommended fully accessing relevant data for informed decisions by addressing issues like lack of search strategy knowledge, unreliable electricity/telecom networks, and ICT illiteracy. Lewandowski (2011) systematically compared the performance of popular search engines on navigational queries, finding major engines like Yahoo, Google, and MSN accurately answered around 90% of queries, outperforming Ask and Exalead. This suggests considering navigational query performance when developing search engines.

Nwokedi and Nwokedi (2017) highlighted some academics' lack of knowledge on using different search engines, impacting internet material access and retrieval. Common search engines used included Excite, MSN, Netscape, Dogpile, Yahoo, Google, AltaVista, Lycos, and Ask Jeeves. Eke, Omekwu, and Agbo (2014) revealed librarians used search engines, university databases, and keyword searches but lacked awareness of other Internet Search Strategies like Boolean operators, phrase searching, and emailing researchers for materials. Onuh and Ekwueme (2020) described how search engines aid information retrieval, keeping people updated on current study/research material. However, respondents may be unaware of innovations in their field, necessitating digital information literacy

in curricula.

Effective information retrieval involves selecting relevant sources from a pool for a specific need, including full-text indexing (Onwukanjo, 2017). Efficiency implies having processes yielding the desired outcome, satisfying users. Information needs differ, necessitating browsing or searching for satisfaction (Bhattacharjee & Sinha, 2016; Case & Given, 2016). Eke, Omekwu, and Agbo (2014) cited poor internet, power supply, and computer literacy hindering internet research at the University of Nigeria, Nsukka. Nyemezu, Edeh, Edereka, and Ugwu (2021) listed obstacles like erratic power supply, expensive data subscriptions, ineffective searching, poor data transfer speeds, inability to afford smartphones/computers, and slow connectivity preventing effective web-based information retrieval in Nigerian universities.

The literature review highlights several research gaps related to librarians' web competencies and search strategies for effective internet-based information retrieval for research. While studies have assessed librarians' general ICT competencies, there is a need for further exploration of the specific web competencies required, as well as an in-depth understanding of the web search strategies employed by librarians and the factors influencing their strategy choices. Additionally, more research is needed to investigate the relationship between librarians' web competencies, web search strategies, and the effectiveness of their internet-based information retrieval efforts for research purposes. The review also identifies gaps in understanding the impact of factors such as ICT infrastructure, training opportunities, and organizational support on the development and application of web competencies and search strategies among librarians. Furthermore, limited research has been conducted on the specific training needs and interventions required to enhance librarians' web competencies and search strategies for effective internet-based research and information retrieval in different geographical and institutional contexts.

3. Methodology

The study adopted a purely quantitative method using a survey as the research design. The population of study consists of librarians in North-central, Nigeria university libraries. Nworgu (2015) asserted that a systematic data collection and description of the traits, characteristics, or facts of a specific population is the aim of descriptive survey research design. The purposive sampling techniques was use to select librarians in eight (8) universities library in North-central, Nigeria. Total enumeration technique or census was utilized to comprise all the 112 librarians in the eight (8) selected university libraries in North-central, Nigeria. A web-based designed questionnaire using Google Forms titled Competencies of ICT, Web, Search Strategies and Effective Research Information Retrieval (CICTWSSERIR) scale of librarians was used for data collection. The questionnaire used in the study consisted of five main divisions, with the first division gathering demographic information, and the second and third divisions measuring respondents' levels of ICT competencies and web competencies, respectively, using adapted six-item scales from Ojiegbe (2010) with response scales ranging from Very High to Very Low, and exhibiting high internal consistency with Cronbach's alpha reliability coefficients of 0.889 and 0.792 respectively. The fourth division which assessed

respondents' web search strategies using a six-item scale adapted from Eke, Omekwu, and Agbo (2014), with response options ranging from Strongly Disagree to Strongly Agree and exhibiting high internal consistency with a Cronbach's alpha reliability coefficient of 0.824. Additionally, the fifth division measured respondents' effective research information retrieval using a five-item scale adapted from Tella, Anyim, Memudu, and Olaniyi (2017), also with response options ranging from Strongly Disagree to Strongly Agree, and displaying high internal consistency with a Cronbach's alpha reliability coefficient of 0.858 in the current study, and 0.89 in the initial instrument. The questionnaire consisted of 27 items and was designed as a web-based form using Google Forms, with a link shared through WhatsApp and Telegram groups by seven research assistants who were trained for two days on distributing the questionnaire and providing guidance on filling it out. A total of 109 responses were collected from librarians in eight designated university libraries in North-central Nigeria, which were analyzed using IBM SPSS version 24 with inferential statistics such as multiple regression analysis and Pearson product moment correlation, with an alpha level of 0.05 for all hypothesis tests. The data collection and analysis were successful, thanks to the cooperation of the respondents and the efforts of the research assistants.

4. Results

The respondents demographic profile revealed that of the 109 librarians surveyed, 41 (37.6%) were females, while 68 (62.4%) were males. This implies that men librarians out number female librarians in North-central Nigerian universities. The respondents' institution distribution revealed that 26 were from University A, 16 were from University B, 15 were from University C, 11 were from University D, and 28 were from University E, while 13 were from University F. The responders' ages range from 20 to 50+ years (M=2.50, SD=0.85). Furthermore, Respondents' educational backgrounds ranged from B.LIS to PhD in library and information studies/science (M=2.13, SD=0.60).

Table 1. Pearson's zero-order correlations between study variables

Variables	*M*	*SD*	1	2	3	4
ICT competencies	1.5505	.38790	1.000			
Web competencies	1.9480	.42413	.683(p=.000)	1.000		
Web search strategies	1.6131	.37876	.521(p=.194)	.733(p=.000)	1.000	
Effective research information retrieval	1.9578	.32781	.402(p=.004)	.622(p=.006)	.514(p=.000)	1.000

Table 1 presents the correlation matrixes for zero-order Pearson of respondents' ICT competencies, web competencies, web search strategies, and effective research information retrieval of respondents. It is presumed that there are significant relationships between ICT competencies and effective research information retrieval (r = .402, p<.05); web competencies and effective research information retrieval (r = .622, p<.05); web search strategies and effective research information retrieval of the respondents (r = .514, p<.05). Clearly, there is a relationship that exits between web competencies and ICT

competencies of the respondents (r = .683, p<.05). Additionally, there is a clear correlation between respondents' web competencies and their web search strategies (r =.733, p<.05). Furthermore, there is no significant correlation between ICT competencies and web search strategies (r = .521, p>.05) of the respondents.

Table 2. Regression of librarian ICT competencies, web competencies, web search strategies and effective research information retrieval (*N*=109)

(a) Model summary					
Multiple R			0.532		
R^2			0.684		
Adjusted R^2			0.663		
Std. error of the estimate			0.681		
(b) ANOVA					
	Sum of squares	*Df*	Mean square	*F*	Sig.
Regression	3.291	3	1.097	37.852	0.000
Residual	8.315	105	0.079		
Total	11.606	108			
(c) Coefficients					
	Unstandardized Coefficients		Standardized Coefficients		
	B	*Std. error*	*β*	*T*	*Sig.*
(Constant)	1.065	0.361		2.947	0.00
ICT competencies	0.123	0.097	0.145	1.270	0.21
Web competencies	0.004	0.093	0.006	0.056	0.96
Web search strategies	0.430	0.077	0.497	5.595	0.00

The result in table 2 displayed the ICT competencies, web competencies, web search strategies, and effective research information retrieval of librarians' regression results. Regression analysis results reveal an adjusted R^2 value of 0.663 ((a) in Table 2) and an F-ratio of 37.852 ((b) in Table 2); the latter is significant at the level of 0.05 (0.000<0.05). According to these findings, the three independent variables—ICT competencies, web competencies and web search strategies—together explained or projected 68.4% of the variations in the librarians' effective research information retrieval as indicated by the R^2 value. The F-ratio suggests that the foretold is also significant.

Table 2 (c) shows the individual contributions of the three factors in determining librarian's effective research information retrieval. Firstly, the results show that every factor significantly influences the forecast, as shown by the significance of the t values, which are higher than 0.05, as shown in the "t" column of the table. Furthermore, the standardised coefficients (β values), which demonstrate the relative significance of each variable influencing librarians effective research information retrieval, showed that ICT competencies contributed few to the determinant of effective research information retrieval (βvalue =0.145), followed in a positive descending sequence of strength by web competencies

(β =0.006), and also followed in order of increasing strength by web search strategies (β =0.497). These results show that the three variables (ICT competencies, web competencies, and web search strategies) make significant contributions to the determinant of librarians' effective research information retrieval.

5. Discussion of findings

This study found a significant relationship between ICT competencies and effective research information retrieval, suggesting that raising ICT competencies will raise effective research information retrieval. In line with this finding, Oyedokun et al. (2018) defined library staffs' ICT competencies as the relevant skills needed to utilize digital information search, access, and delivery to the fullest extent possible, and as the acquisition of knowledge and skills necessary for carrying out tasks in a professional manner in the workplace.

Based on this, the study revealed that web competencies had a positive influence on the effective research information retrieval of librarians. This result is in consonance with Kankam and Nsibirwa (2019) stated that information users must be competent and skilled to obtaining online information on the web effectively.

Furthermore, the research also established a significant relationship between web search strategies and effective research information retrieval, thereby indicating that a rise in effective research information retrieval will be accompanied by a rise in web search strategies. This agreed with the study of Tella et al. (2017) who conducted a study that found that certain factors, such as search engines, Boolean search operators, and emotional intelligence, have a significant impact on the effectiveness of information retrieval.

Additionally, this study found that ICT competencies, web competencies, and web search strategies are important factors in effective research information retrieval among librarians. The relationship that occurs in this study among ICT competencies, web competencies, web search strategies, and effective research information retrieval corresponds with that of Nyemezu et al. (2021) study that most online search engines, with the exception of Bing, Yahoo, Google scholar, and Google, tend to have poor performance. Among these four search engines, only Google is extensively used by users, whereas Bing, Yahoo, and Google Scholar are rarely used. The findings also correspond with the study of Amua-Sekyi and Asare (2016) found that respondents possess ICT skills such as Internet access, word processing, database searching, presentation delivery, and email communication, but highlight the importance of information-seeking online to connect with global education. These results also concur with those of other research by Eke et al. (2014) highlighted that librarians in their study utilized search engines, databases available at the university library, and keyword searches to conduct research, but they lacked awareness of other Internet Search Strategies (ISS) such as Boolean operators, phrase searching, and emailing researchers to request research materials, as revealed by the current study. The findings is also in line with the study of Pavani and Veerla (2019) who stated that online search systems are characterized by several features, including information coverage and sources, indexing mechanisms, vocabulary management, searching tools, ranking strat-

egies, search changes, and online search systems.

6. Conclusion

This study underscores the significant influence of ICT competencies, web competencies, and web search strategies on the effective retrieval of research information among librarians. The findings reveal that proficiency in ICT skills is essential for leveraging digital resources and technologies to their fullest extent, thereby enhancing information retrieval efficiency. Moreover, the positive correlation between web competencies and effective research information retrieval highlights the importance of navigating the online landscape adeptly to access relevant information. Additionally, the study underscores the critical role of employing effective web search strategies in locating and retrieving pertinent research materials. Collectively, these findings emphasize the interconnectedness of ICT competencies, web competencies, and web search strategies in optimizing research information retrieval processes in university libraries.

7. Implications of the Research

These findings have significant implications for library practice and professional development. The importance of continuous training and professional development initiatives aimed at enhancing librarians' ICT competencies, web competencies, and web search strategies. Libraries should prioritize investing in training programs tailored to improve digital skills among library professionals. Furthermore, academic institutions offering Library and Information Science programs should revise their curricula to incorporate modern ICT and web competencies, ensuring graduates are adequately prepared for the evolving demands of the profession. Additionally, libraries should allocate resources towards upgrading ICT infrastructure and providing access to advanced digital resources, thereby facilitating effective research information retrieval. Lastly, user education initiatives should be implemented to empower library users with the skills and knowledge necessary to navigate digital resources independently, thereby enhancing their overall information literacy and research capabilities.

8. Recommendations

The following recommendations are given in light of the study's findings:
(1) Libraries should collaborate with ICT training centers to offer specialized training programs tailored to enhance the ICT competencies of librarians.
(2) Organize workshops focusing on improving web competencies, including online navigation, evaluation of digital resources, and utilization of online databases and platforms.
(3) Implement training sessions on advanced web search strategies, emphasizing the use of Boolean operators, search engines, and other innovative search techniques to enhance information retrieval

efficiency.

(4) Establish mechanisms for continuous assessment of librarians' competencies and gather feedback from users to identify areas for improvement and tailor training programs accordingly.

References

Madu, A. U., Vandi, I., & Chagwa, S. M. (2018). Availability and utilisation of ICT for information retrieval by undergraduate students in Ramat library, university of Maiduguri: a case study. *IOSR Journal of Humanities and Social Science (IOSR-JHSS), 23*(5), 35-42.

Ademodi, D. T., & Adepoju, E. O. (2019). Computer skills among librarians in academic libraries in Ondo and Ekiti States, Nigeria. *Library Philosophy and Practice (e-journals),* 274. https://digitalcommons.unl.edu/libphilprac/274

Adomi, E. E. (2012). Information sources in the humanities. Ethiope Publishing Corporation.

Afebende, G. B. (2019). Information search strategies as correlate of information resource utilization in academic libraries. *International Journal of Library and Information Science Studies, 5*(5), 34-42.

Afebende, G. B., & Nna-Etuk, G. M. (2019). Information retrieval tools and utilization of library resources by undergraduate students in federal universities in south-south zone Nigeria. *International Journal of Library and Information Science, 5*(2), 36-44.

Ahmad, S., Lone, J. A., & Basharat, M. (2020). Perception of using ICT in libraries: a survey of library professionals working in Government Degree Colleges of Kashmir (J&K)-India. *Pearl: A Journal of Library and Information Science, 14*(1), 65-70. http://dx.doi.org/10.5958/0975-6922.2020.00009.1

Akanbi, M. L., Ajani, M. T., & Bankole, Q. A. (2021). Utilization of Internet Search Engines by Master Degree Students at University of Ilorin. *International Journal of Information Processing and Communication (IJIPC), 11*(1), 69-83.

Al-Aufi, A. S., Al-Azri, H. M., & Al-Hadi, N. A. (2017). Perceptions of information literacy skills among undergraduate students in the social media environment. *International Information & Library Review, 49*(3), 163-175. https://doi.org/10.1080/10572317.2017.1293416

Amua-Sekyi, E. T., & Asare, P. Y. (2016). A survey of information communication technology: An international experience based on Bellanet's work in the South. *Knowledge Management for Development Journal, 3*(1), 68-78.

Ashraf, M. A., Iqbal, J., Arif, M. I., & Asghar, M. Z. (2022). Fostering ICT competencies in blended learning: role of curriculum content, material, and teaching strategies. *Frontiers in Psychology, 13*, 758016. https://doi.org/10.3389/fpsyg.2022.758016

Ayoku, O. A., & Okafor, V. N. (2015). ICT skills acquisition and competencies of librarians. *The Electronic Library, 33*(3), 502-523. http://dx.doi.org/10.1108/EL-08-2013-0155

Bajpai, V. K., & Madhusudhan, M. (2019). ICT Skills and Competencies of Library and Information Science Professionals working in College Libraries, University of Delhi: A study. *Library Philosophy and Practice (e-journal)*, 2275. https://digitalcommons.unl.edu/libphilprac/2275.

Baro, E. E., Obaro, O. G., & Aduba, E. D. (2019). An assessment of digital literacy skills and knowledge-based competencies among librarians working in university libraries in Africa. *Digital Library Perspectives, 35*(3/4), 172-192. https://doi.org/10.1108/DLP-04-2019-0013

Borca G., Bina M., Keller P. S., Gilbert L. R., & Begotti, T. (2015). Internet use and developmental tasks: Adolescents' point of view. *Computer in Human Behaviour, 52*, 49-58. https://doi.org/10.1016/j.chb.2015.05.029

Case, D. O., & Given, L. M. (Eds.). (2016). *Looking For Information: A Survey of Research on Information Seeking, Needs, and Behavior*. Emerald Group Publishing.

Chae, H., Koh, C. E., & Park, K. O. (2018). Information technology capability and firm performance: role of industry. *Information & Management, 55*(5), 525-546. https://doi.org/10.1016/j.im.2017.10.001

Cheng, G., & Chau, J. (2016). Exploring the relationships between learning styles, online participation, learning achievement and course satisfaction: an empirical study of a blended learning course. *British Journal of Educational Technology, 47*(2), 257-278. https://doi.org/10.1111/bjet.12243

Doyle, A. (2019). Information and communications technology (ICT) skills of librarians. *Electronic Library, 33*(3), 502-523.

Eke, H. N., Omekwu, C. O., & Agbo, J. (2014). Internet search strategies employed by library and information science students of university of Nigeria, for research. *Library Philosophy and Practice (e-journal)*, 1194. http://digitalcommons.unl.edu/libphilprac/1194

Hussain, M., & Nayab, S. (2021). Assessment of ICT competencies of LIS professionals in public libraries of Khyber Pakhtunkhwa: a quantitative study. *Library Philosophy and Practice (e-journal)*, 5661. https://digitalcommons.unl.edu/libphilprac/5661

Jabbarova, A. (2020). Formation of professional competencies in the course of preparing and conducting business games in English classes. *Journal of Foreign Languages and Linguistics, 1*(1), 38-42. https://journal.jspi.uz/index.php/fll/article/view/12

Kaltimani, S. F., & Naik, R. R. (2013). Evaluation of librarianship and ICT skills of library and information professionals working in the engineering college libraries in Karnataka, India: a survey. *Program: Electronic Library and Information Systems, 47*(4), 345-369.

Kankam, P. K., & Nsibirwa, Z. (2019). Internet access and information retrieval competencies of high school students in Ghana. *Library Philosophy and Practice (e-journal)*, 2342. https://digitalcommons.unl.edu/libphilprac/2342

Koesten, L., Kacprzak, E., & Tennison, J. (2016, July 21). *Learning when searching for web data.* Semantic Scholar. https://pdfs.semanticscholar.org/b001/55fd29ddcf8ad0f3c119a2d0e47e9cd33c87.pdf

Kroustallaki, D., Kokkinaki, T., Sideridis, G. D., & Simos, P. G. (2015). Exploring students' affect and achievement goals in the context of an intervention to improve web searching skills. *Computers in Human Behavior, 49*, 156-170. https://doi.org/10.1016/j.chb.2015.02.060

Lewandowski, D. (2011). The retrieval effectiveness of search engines on navigational queries. *Aslib Proceedings, 63*(4), 354-363. https://doi.org/10.1108/00012531111148949

Malliari A., Togia A., Korobili S., & Nitsos I. (2014). Information literacy skills of Greek high school students: results of an empirical survey. *Qualitative and Quantitative Methods in*

Libraries, 3(1), 271-281. http://www.qqml.net/index.php/qqml/article/view/137

Mamza, W. P., & Waba, Y. Y. (2021). A survey of ICT search strategy skills among academic staff in Modibbo Adama University of technology Yola, Adamawa State, Nigeria. *International Journal of Innovative Science and Research Technology, 6*(11), 329-334.

Murawski, M., & Bick, M. (2017). Digital competences of the workforce-a research topic? *Business Process Management Journal, 23*(3), 721-734. https://doi.org/10.1108/BPMJ-06-2016-0126

Nneka, E. H., Obiora, O. C., & Juliet, A. (2014). Internet search strategies employed by library and information science students of the University of Nigeria, for research. *Library Philosophy and Practice (e-journal)*, 1194. http://digitalcommons.unl.edu/libphilprac/1194.\

Nwokedi, V. C., & Nwokedi, G. I. (2017). Assessment on use of search engines by lecturers in the faculty of medical sciences, University of Jos, Nigeria. *Journal of Applied Information Science and Technology, 10*(2), 23-32. http://www.jaistonline.org/10vol2/3.pdf

Nworgu, B. G. (2015). *Educational Research: Basic issues and methodology* (3rd ed.). University Trust Publishers.

Nyemezu, C. O., Edeh, E. N., Edereka, I. O., & Ugwu, N. R. (2021). Empirical study of the awareness and utilization of internet search engine among undergraduate students of Nigerian universities for effective information retrieval on the web. *Library Philosophy and Practice (e-journal),* 6501. https://digitalcommons.unl.edu/libphilprac/6501

Obat, R. (2019, March 25-29). *Self-Assessment of information retrieval skills in using electronic information resources: A case study of Maseno University students*. [Paper presentation]. University of Pretoria and the Carnegie Corporation of New York Capstone Conference, Pretoria, South Africa.

Ojiegbe, N. (2010). *ICT competencies of library staff at the university of Abuja, FCT and university of Jos, Plateau State* [Master's thesis, University Of Nigeria, Nsukka].

Okehie, E. K., Nnadieto, G. C., Obiano, D. C., & Ogonna, N. M. (2022). Information and communication technology (ICT) competence and job performance of librarians in universities in Abia State. *Library Philosophy and Practice (e-journal)*, 7214. https://digitalcommons.unl.edu/libphilprac/7214

Olatoye, O. I., Nekhwevha, F., & Muchaonyerwa, N. (2021). ICT literacy skills proficiency and experience on the use of electronic resources amongst undergraduate students in selected Eastern Cape Universities, South Africa. *Library Management, 42*(6/7), 471-479. https://doi.org/10.1108/LM-08-2020-0118

Omehia, A., Okwu, E., & Nsirim, O. (2021). Librarians' ICT competencies and utilization of emerging technologies in academic libraries in Rivers State, Nigeria. *Library Philosophy and Practice (e-journal),* 5410. https://digitalcommons.unl.edu/libphilprac/5410

Onuh, S. J., & Ekwueme, O. L. (2020). Awareness and utilization of search engines for information retrieval by students of national open university of Nigeria in Enugu study centre library (2020). *Library Philosophy and Practice (e-journal),* 4650. https://digitalcommons.unl.edu/libphilprac/4650

Onuoha, J., Akidi, A., & Chukwueke, A. (2019, July 9-13). Effects of ICT skills in knowledge sharing: A focus on library and information science educators in Michael Okpara university

of agriculture, Umudike [Paper presentation]. National Association of Library and Information Science Educators 21st National Conference/AGM, Ignatius Ajuru University of Education, Port Harcourt, Rivers State, Nigeria.

Onwukanjo, S. (2017). *Homophily-Heterophily Staff Quality, Information Literacy and Availability of Information Resources as Correlates of Effective Reference Services in University Libraries of North Central Nigeria* [Doctoral dissertation, University of Ibadan].

Oyedokun, T. T., Oyewumi, F. A., Akanbi, M. L., & Laaro, D. M. (2018). Assessment of ICT competencies of library staff in selected universities in Kwara state, Nigeria. *Library Philosophy and Practice (e-journal),* 1797. http://digitalcommons.unl.edu/libphilprac/1797

Oyieke, L. I., & Dick, A. L. (2017). Empowering academic librarians for effective e-services: An assessment of Web 2.0 competency levels. *The Electronic Library, 35*(2), 263-282. https://doi.org/10.1108/EL-10-2015-0200

Pavani, V., & Veerla, B. (2019). Information retrieval - techniques and strategies. *Journal of Emerging Technologies and Innovative Research (JETIR), 6*(11), 369-374.

Rana, J. I., & Bhatti, R. (2020). Use of ICT in collection management of public libraries in Punjab, Pakistan *Library Philosophy and Practice (e-journal),* 4745. https://digitalcommons.unl.edu/libphilprac/4745

Sales, D., Pinto, M., & Fernández-Ramos, A. (2018). Undressing information behaviour in the field of translation: A case study with Translation trainees. *Journal of Librarianship and Information Science, 50*(2), 186-198. https://doi.org/10.1177/0961000616666131

Sanchiz, M., Amadieu, F., Fu, W. T., & Chevalier, A. (2019). Does pre-activating domain knowledge foster elaborated online information search strategies? Comparisons between young and old web user adults. *Applied ergonomics, 75*, 201-213. https://doi.org/10.1016/j.apergo.2018.10.010

Sarfo, F. K., Amankwah, S. K., Oti-Agyen, P., & Yidana, I. (2016). Information and communication technology access and use and competency level among second-cycle school teachers in Ghana. *Electronic Library, 8*(5), 43-51.

Shastri, D. K., & Chudasma, P. (2022). The perception of ICT skills and challenges of usage of technologies among the library professionals of the Gujarat State during the COVID 19: a comprehensive study. *Quality & Quantity, 56*, 1093-1120. https://doi.org/10.1007/s11135-021-01167-x

Tella, A. (2011). Predictors of undergraduates' students' web search effectiveness. *International Journal of Information Studies, 3*(3), 95-105.

Tella, A., Anyim, O. A., Memudu, S. A., & Olaniyi, O. T. (2017). Predictors of information retrieval effectiveness among library and information science undergraduates in Kwara State universities. *Library Philosophy and Practice (e-journal),* 1626. https://digitalcommons.unl.edu/libphilprac/1626.

Thanuskodi, S. (2019). Information search strategies among LIS professionals: a case study of selected institutions in India. *Library Philosophy and Practice (e-journal),* 2154. http://digitalcommons.unl.edu/libphilprac/2154

Tsai, M. J., Hsu, C. Y., & Tsai, C. C. (2012). Investigation of high school students' online science

information searching performance: the role of implicit and explicit strategies. *Journal of Science Education and Technology, 21*(2), 246-254.

Tsai, M. J., Liang, J. C., Hou, H. T., & Tsai, C. C. (2012). University students' online information searching strategies in different search contexts. *Australasian Journal of Educational Technology, 28*(5), 881-895 http://dx.doi.org/10.14742/ajet.822.

University of Johannesburg Library [UJL] (2020). *Library - Information Literacy Module: Search Strategies*. University Library. https://uj.ac.za.libguides.com/c.php?g=581225

Uwaifo, S. O. (2013). Librarians in use of internet by university libraries in the South-south zone, Nigeria. *International Journal of Scientific & Technology Research, 2*(3), 290-294.

Zhang, Y., & Yang, J. (2022). Research on Information Retrieval Effectiveness of University Scientific Researchers Based on Mental Model. *Wireless Communications and Mobile Computing, 2022*. https://doi.org/10.1155/2022/5852946

[About the authors]

Qudus Ajibola Bankole is a Research Officer at the Kwara State Internal Revenue Service, Ilorin, Nigeria. He holds a bachelor's degree in Library and Information Science from Kwara State University, Malete, Nigeria, and a master's degree in the same discipline from the Department of Library and Information Science, University of Ilorin, Ilorin, Nigeria. He has published in reputable local and international journals.

Kabiru Gambari Sulaiman is currently a Librarian II at the Kwara State Library Board, Ilorin, Nigeria. He holds a bachelor's degree in Library and Information Science from Kwara State University, Malete, Nigeria, and a master's degree in the same discipline from the Department of Library and Information Science, University of Ilorin, Ilorin, Nigeria.

Abdulfatai Saliu is currently an Assistant Librarian at Afe Babalola University, Ado Ekiti, Nigeria. He holds a bachelor's degree in Library and Information Science from Kwara State University, Malete. He furthered his education by obtaining a master's degree in the same discipline from the University of Ilorin. He is currently pursuing a Doctor of Philosophy in Library and Information Science from the Department of Library and Information Science at the Federal University of Oye Ekiti.

Sulyman Olaitan Mahammuod works as a Lecturer III in the Department of Library and Information Science at Federal Polytechnic, Offa, Nigeria. He holds a bachelor's degree in Library and Information Science from Kwara State University, Malete, Nigeria, and a master's degree in the same discipline from the Department of Library and Information Science, University of Ilorin, Ilorin, Nigeria.