

## Information Literacy Skills and Digital Literacy Skills as Correlates of Librarians' Use of Cloud Computing Technologies in Nigerian University Libraries

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### ARTICLE INFO

#### *Article history:*

Online First 12 August 2026

#### *Keywords:*

Information Literacy,  
Digital Literacy,  
Cloud Computing,  
Librarians,  
University Libraries,  
Delta State,  
Nigeria

### ABSTRACT

The present study examined information literacy skills and digital literacy skills as correlates of librarians' use of cloud computing technologies in university libraries in Delta State, Nigeria. A correlational research design was adopted to investigate the nature and strength of relationships among the variables without manipulation. The population comprised all 157 librarians in the 10 university libraries in the state, and a census approach was employed. Data were collected using three validated instruments: the Cognitive Ability Test of Librarians' Information Literacy Skills (CATLILS), the Cognitive Ability Test of Librarians' Digital Literacy Skills (CATLDLS), and the Use of Cloud Computing Technologies Questionnaire (UCCTQ). Reliability coefficients of 0.85 and 0.82 were obtained for CATLILS and CATLDLS using Kuder-Richardson Formula 20, while a Cronbach's alpha coefficient of 0.77 was obtained for UCCTQ. Out of 157 copies administered, 122 were retrieved, representing a 77% response rate. Data were analysed using Pearson Product Moment Correlation and multiple regression at the 0.05 level of significance. The findings revealed significant positive relationships between information literacy skills and librarians' use of cloud computing technologies ( $r = 0.853$ ,  $p < 0.05$ ), as well as between digital literacy skills and librarians' use of cloud computing technologies ( $r = 0.681$ ,  $p < 0.05$ ). Multiple regression analysis further showed that information literacy skills and digital literacy skills jointly explained 44.9% of the variance in librarians' use of cloud computing technologies, with information literacy skills making the greater unique contribution to the prediction of cloud computing technology use. The study contributes empirical evidence on information literacy skills and digital literacy skills as correlates of librarians' use of cloud computing technologies in university libraries in Nigeria, thereby addressing a gap in the literature on cloud technology adoption in developing-country contexts.

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## 1. Introduction

Technology has changed and continues to change the way we live our lives. University libraries are no exceptions. This is in tandem with the 5th law of the library as postulated by Ranganathan that the library is a growing organism. That growth is not only in the collections of the library or in its physical edifice. It also includes the processes through which university libraries carry out their functions. The advancement in technology has re-enforced the need for university authorities to prioritize it for use in university libraries especially for modern day students who are digital natives. These technologies include computers, video conferencing, printing technology, online public access catalogue among others. In particular, university libraries have undergone massive transformation with the increasing integration of digital resources and cloud computing technologies into their offerings.

Cloud computing technologies refer to internet-based computing resources that enable users to access shared computing services rather than relying on local servers or personal devices. They encompass a broad range of internet-connected tools and resources used for information management, communication, creation, and distribution (Unuigboje et al., 2024; Mell & Grance, 2011). Cloud computing offers flexible, scalable, and cost-effective services by eliminating the need for users to manage physical hardware while providing on-demand access to computing resources. It relies on technologies such as virtualization, multi-tenancy, scalability, and load balancing to ensure efficient resource allocation and optimal system performance (Adejo, 2024). Operationally, cloud computing technologies in this study refer to internet-based computing resources utilised by librarians to facilitate efficient information storage, retrieval, sharing, and overall library service delivery.

The adoption and utilisation of cloud computing technologies have become increasingly important for university libraries seeking to enhance the efficiency, accessibility, and sustainability of their information services. The integration of these technologies has transformed the way contemporary libraries deliver information services by supporting automation, networking, and virtual service environments (Bashorun et al., 2020; Tella et al., 2020). University libraries' main objective is to support the university community in teaching, learning, and research, and cloud computing technologies have become indispensable in achieving this objective through enhanced access to information resources and improved service delivery. Cloud computing technologies rely on large-scale data centres that provide shared, on-demand computing resources and services, including servers, storage, networking, databases, and software, over the Internet (Mell & Grance, 2011). Consequently, libraries are increasingly integrating cloud computing technologies into their service delivery processes in response to global digital transformation. This trend has accelerated the reconfiguration of university library operations worldwide. The main potential of cloud computing technologies lies in improving access to information, enhancing resource management, and facilitating collaborative learning. In the Western world, many universities have already deployed cloud-based solutions for digital resource management, utilising services such as Amazon Web Services and Google Cloud. This has enabled seamless access to academic resources, expanded storage capacity, and improved user experiences (Abdulwahab et al., 2022). By leveraging cloud computing technologies, university libraries are able to strengthen

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collaboration, streamline operations, and foster innovation in information service delivery.

The use of cloud computing technologies in university libraries in Africa is young but rapidly gaining momentum. As noted in a report by Olanrewaju et al. (2023), whereas many institutions on the African continent face challenges due to infrastructure limitation, cloud technologies offer a pivotal solution in data hosting, preservation, and accessibility. Cloud computing offers several benefits to academic libraries, including improved access to information resources, flexibility in service delivery, reduced risk of data loss, and enhanced efficiency in providing web-based library services (Kayode et al., 2020; Sivankalai, 2021). The libraries of Nigerian universities have been embracing cloud computing technologies, with the likes of the University of Lagos already integrating cloud services into the university to boost their digital repositories. The increasing adoption of cloud computing in academic libraries requires librarians to develop the knowledge and technical competencies necessary to implement, manage, and support cloud-based information services effectively (Tella et al., 2020).

With the continuous development of cloud computing technologies, their implementation within university libraries has become an important driver of innovation, enhancing service delivery, resource sharing, and access to scholarly information across diverse educational contexts. The role of librarians has consequently evolved, placing them as critical enablers of information access and engagement, as they increasingly rely on cloud computing technologies to support information organization, retrieval, preservation, and dissemination. However, it is expected of librarians to be literate in Information and Communication Technologies (ICTs) so as to effectively adopt and utilise cloud computing technologies in university libraries (Omehia et al., 2021; Olukayode et al., 2022). Although cloud computing technologies provide enormous opportunities for improving academic library services, their successful adoption is largely dependent on the competencies of librarians who implement and manage them. The mere availability of cloud technologies does not automatically translate into effective utilisation. Rather, librarians require adequate information literacy and digital literacy skills to evaluate, integrate, and apply cloud-based technologies in support of teaching, learning, research, and knowledge management. Accordingly, the effective utilisation of cloud computing technologies requires librarians to possess strong information literacy and digital literacy skills, which enable them to adapt to emerging technologies and deliver innovative library services.

Information literacy skills encompass the ability to recognise information needs and to identify, locate, evaluate, and ethically use information for effective decision-making and problem-solving. In today's digital information environment, these competencies are essential for navigating the vast volume of available information through critical thinking and lifelong learning. Operationally, information literacy skills in this study refer to librarians' ability to identify, access, critically evaluate, and effectively utilise information from diverse sources to support library service delivery and the adoption of cloud computing technologies. These skills enable librarians to distinguish credible information from unreliable sources, understand the relevance of information within specific contexts, and integrate new knowledge with existing understanding. Information literacy skills have also been associated with librarians' ability to adopt and utilise digital technologies effectively (Jabeen & Mehmood, 2023). Consequently, librarians rely on these competencies to critically evaluate digital resources, identify appropriate cloud-based solutions, and support users in accessing and utilising

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scholarly information effectively within contemporary university libraries.

Digital literacy skills are the competencies required to access, manage, understand, integrate, communicate, evaluate, and create information safely and appropriately using digital technologies (Law, et al. 2018). Operationally, digital literacy skills in this study refer to the competencies acquired by librarians to effectively navigate digital environments and utilise digital technologies in delivering library services through cloud computing platforms. Digital literacy extends beyond technical skills to encompass information and data literacy, communication and collaboration, digital content creation, safety (including the protection of personal data and privacy), and problem-solving in digital environments (Vuorikari et al., 2022). These competencies enable librarians to search for information efficiently, assess the credibility of online sources, and utilise digital tools responsibly while observing issues relating to intellectual property and online ethics. Digital literacy complements information literacy by equipping librarians with the technical competencies required to effectively utilise cloud computing platforms, digital repositories, collaborative technologies, and other emerging digital services. As academic libraries increasingly migrate towards cloud-enabled environments, digital literacy has become an essential professional competency rather than an optional skill.

In this fast-changing world of technology, digital literacy skills are central to personal, academic, and professional success and for meaningful participation in contemporary society. These skills are not supplementary but constitute the backbone of effective library services in the digital age. Consequently, librarians are expected to remain at the forefront of technological adaptation and innovation. According to the Association of College and Research Libraries (2016), librarians play an important educational role by facilitating students' information literacy development and collaborating with faculty to enhance learning. Moreover, the interaction between information literacy and digital literacy extends beyond individual competence to shape the quality of library services and user experience. Information- and digitally literate librarians are better positioned to lead collaborative initiatives, make informed decisions on resource optimization, and effectively manage digital information resources in contemporary library environments. These competencies enable librarians to provide effective support to students and faculty, promote digital engagement, and strengthen research and learning in academic environments. More importantly, they facilitate the effective adoption and utilisation of cloud computing technologies. Collectively, these observations suggest that information literacy and digital literacy are complementary competencies that jointly support librarians' effective utilisation of emerging technologies. While information literacy primarily strengthens the critical evaluation and management of information resources, digital literacy provides the technical competencies required to implement and utilise cloud computing technologies effectively.

Although these competencies are widely recognised as essential for effective cloud computing adoption, their practical application often depends on the institutional and technological contexts within which librarians operate. In developing countries such as Nigeria, disparities in ICT infrastructure, digital capacity, and institutional support continue to influence the extent to which university libraries can harness the benefits of cloud computing technologies. The context of Delta State, in particular, presents both challenges and opportunities for university libraries embracing cloud computing technologies. Although librarians continue to face challenges such as inadequate ICT infrastructure, inconsistent power supply, and limited training opportunities, recent studies have empha-

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sized the need for structured digital skills training and institutional support to strengthen digital competencies among library and information professionals (Ogunbodede & Atchimi, 2024; Salau et al., 2024). Despite these initiatives, observations by the researcher and interactions with librarians indicate that the utilisation of cloud computing technologies in university libraries across Delta State remains relatively low. This raises concerns about whether librarians possess the information literacy and digital literacy skills required to effectively utilise cloud computing technologies. The persistent low utilisation of cloud computing technologies among librarians is therefore of concern to university administrators, policymakers, and other stakeholders because it may undermine effective library service delivery in an increasingly digital environment. It is against this background that the present study examined information literacy skills and digital literacy skills as correlates of librarians' use of cloud computing technologies in university libraries in Delta State.

### *1.1 Statement of the Problem*

The use of cloud computing technologies among librarians is not only important but urgent in the light of current global trends. It is expected that librarians in university libraries prioritise the use of these technologies to effectively meet the information needs of contemporary library patrons, who are increasingly digital natives. The rising adoption of cloud computing technologies in library systems demands that librarians possess not only technical competencies but also adequate information literacy and digital literacy skills to effectively identify, evaluate, organise, manage, and disseminate digital information resources. Without these competencies, the substantial investments made in cloud computing infrastructure may not translate into improved library service delivery or enhanced access to scholarly information.

This situation brings into question the ability of university libraries in Delta State to provide optimum information services within an increasingly digital environment, especially in the face of rapid technological advancement, evolving university curricula, and changing user expectations. The current situation, as observed by the researchers through interactions with librarians in university libraries in Delta State, indicates a relatively low utilisation of cloud computing technologies for efficient and effective library service delivery despite the numerous benefits associated with these technologies. This situation suggests that the availability of cloud computing technologies alone may not guarantee their effective utilisation unless librarians possess the competencies required to adopt and use them successfully.

Although previous studies have examined information literacy, digital literacy, and cloud computing in different contexts, most have investigated these variables independently or have focused on students, faculty members, or library users rather than professional librarians. Furthermore, relatively few empirical studies have examined the combined influence of information literacy skills and digital literacy skills on librarians' use of cloud computing technologies, particularly within university libraries in Delta State, Nigeria. Consequently, there is limited empirical evidence on the extent to which these competencies explain librarians' utilisation of cloud computing technologies in this context. Additionally, a diligent search of the literature reveals a paucity of studies specifically investigating the contributions of information literacy skills and digital literacy skills to librarians' use of cloud

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computing technologies in university libraries. This knowledge gap limits the ability of university administrators, library managers, and policymakers to develop evidence-based strategies for strengthening librarians' competencies and promoting the effective adoption of cloud computing technologies. It was against this background that this study investigated information literacy skills and digital literacy skills as correlates of librarians' use of cloud computing technologies in university libraries in Delta State.

### *1.2 Purpose of the Study*

The purpose of the study was to examine information literacy and digital literacy skills as correlates of librarians' use of cloud computing technologies in university libraries, Delta state. Specifically, this study sought to determine the:

Relationship between librarians' information literacy skills and use of cloud computing technologies in university libraries in Delta State.

Relationship between librarians' digital literacy skills and use of cloud computing technologies in university libraries in Delta State.

Joint correlation of librarians' information literacy skills and digital literacy skills with use of cloud computing technologies in university libraries in Delta State.

### *1.3 Research Questions*

What is the relationship between librarians' information literacy skills and their use of cloud computing technologies in university libraries in Delta State?

What is the relationship between librarians' digital literacy skills and their use of cloud computing technologies in university libraries in Delta State?

What is the joint correlation of librarians' information literacy skills and digital literacy skills with their use of cloud computing technologies in university libraries in Delta State?

### *1.4 Hypotheses*

H01: There is no significant relationship between librarians' information literacy skills and their use of cloud computing technologies in university libraries in Delta State.

H02: There is no significant relationship between librarians' digital literacy skills and their use of cloud computing technologies in university libraries in Delta State.

H03: There is no significant joint correlation of librarians' information literacy skills and digital literacy skills with their use of cloud computing technologies in university libraries in Delta State.

## **2. Literature Review**

### *2.1 Theoretical Framework*

The Unified Theory of Acceptance and Use of Technology (UTAUT), created by Viswanath

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Venkatesh, Michael G. Morris, Gordon B. Davis, and Fred D. Davis in 2003, which posits that there are factors influencing an individual's intention to use and actual use of a technology provides a solid framework for understanding how librarians adopt and use cloud computing technologies in this study. The main concepts, including performance expectancy, effort expectancy, social influence, and facilitating conditions, align well with the study's variables and help clarify the observed relationships. In terms of performance expectancy, the study highlights the importance of information literacy and digital literacy skills. These skills allow librarians to recognize and make the most of the benefits offered by cloud computing technologies. Librarians who excel in these areas are more likely to believe that cloud tools enhance efficiency, collaboration, and service delivery, which increases their likelihood of using these tools. The study also examined the connection between effort expectancy and digital literacy skills. Librarians with strong digital skills tend to view cloud computing platforms as user-friendly and manageable, making them seem less complicated and easier to adopt. Conversely, lower digital literacy may cause these tools to appear more challenging, which could discourage their use. While social influence is not directly measured, it exists within the professional and institutional context of university libraries. Librarians operate in environments where their peers' use of cloud computing, professional standards, and management's expectations can affect their perceptions. Information literacy programmes and collaborative workspaces further strengthen these social dynamics. The study describes the broader institutional environment, which includes ICT infrastructure and support systems in Delta State universities, showing how facilitating conditions are present. Although the study primarily focuses on individual skills, these skills interact with available resources and organizational support, which can either ease or complicate technology use. The UTAUT framework supports the study by clarifying how information literacy and digital literacy skills are key factors that influence librarians' actual use of cloud computing technologies, reinforcing the empirical findings about their predictive impact.

The application of UTAUT in this study extends beyond providing a general explanation of technology adoption by explicitly linking its constructs to the study variables and the measurement instruments. Specifically, information literacy skills and digital literacy skills represent individual capabilities that influence librarians' performance expectancy and effort expectancy regarding cloud computing technologies, while the Use of Cloud Computing Technologies Questionnaire (UCCTQ) measures the actual technology use predicted by these constructs. Consequently, the Cognitive Test on Information Literacy Skills (CATLILS), the Cognitive Test on Digital Literacy Skills (CATLDLS), and the UCCTQ operationalize the UTAUT framework by examining how librarians' competencies translate into the adoption and use of cloud computing technologies in university libraries.

## *2.2 Librarians' Information Literacy Skills and their Use of Cloud Computing Technologies in University Libraries*

The convergence of librarianship, information literacy (IL) competencies, and cloud computing has attracted increasing scholarly attention in recent years, particularly within university library contexts. As university libraries continue to transition from traditional service models to cloud-enabled environments, information literacy has emerged as a critical professional competency for librarians.

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The ability to locate, evaluate, organise, and apply information effectively has become increasingly important for managing digital resources and supporting cloud-based library services.

Information literacy has long been recognised as a fundamental competency for information professionals. The Association of College and Research Libraries (ACRL, 2016) conceptualises information literacy as a set of integrated abilities involving the reflective discovery of information, understanding how information is produced and valued, and using information to create new knowledge while participating ethically in learning communities. Similarly, the Chartered Institute of Library and Information Professionals (Secker, 2018) defines information literacy as the ability to think critically and make balanced judgements about the information people find and use, enabling them to make informed decisions and participate effectively in society. These internationally recognised frameworks indicate that information literacy extends beyond locating information to encompass the critical evaluation, ethical use, organisation, and effective application of information within technology-rich environments such as cloud computing.

Existing empirical studies underscore the importance of information literacy as a fundamental competency for effective technology utilisation in library environments. Anunobi and Udem (2014, 2015) demonstrated that information literacy equips librarians with the competencies required to identify, retrieve, evaluate, and use information effectively. Building on these foundational competencies, Andrikopoulou et al. (2021) highlighted the role of specialised information and data literacy skills in strengthening digital resource management and research data support within technology-enabled library environments. Similarly, Mabawonku et al. (2024) reported that librarians' technical competencies and institutional readiness are important factors associated with the adoption of cloud computing technologies in academic libraries. Collectively, these studies suggest that information literacy provides an essential foundation for the effective utilisation of digital technologies in libraries, including cloud computing. Nevertheless, the existing literature has examined these issues from different perspectives, focusing on information literacy competencies, digital resource management, research data support, or cloud computing adoption independently, rather than examining the relationship between librarians' information literacy skills and their use of cloud computing technologies in university libraries.

Further support for the importance of information literacy is provided by studies conducted in related contexts. For instance, Mordi and Ekoko (2025) found that information literacy skills significantly predicted the use of library resources among polytechnic students in Nigeria, suggesting that such competencies are important determinants of effective information utilisation. Although their study focused on students rather than librarians, the findings provide indirect evidence that stronger information literacy competencies are associated with more effective use of digital information resources. Given that librarians perform more specialised information management functions than students, these findings cannot be directly generalised; however, they offer useful contextual support for examining the relationship between information literacy skills and librarians' use of cloud computing technologies.

Beyond facilitating librarians' own use of digital technologies, information literacy also strengthens their instructional and user-support responsibilities within academic libraries. As academic libraries increasingly adopt cloud computing for web-based library services, librarians are required to utilize

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these technologies to enhance service delivery. In addition, librarians support online teaching and learning by providing information literacy instruction, online workshops and tutorials, training for lecturers on online platforms, and virtual assistance to students (Kayode et al., 2020; Ogunbodede & Wiche, 2022). Consequently, librarians who are information literate are better equipped to transfer these competencies to users, thereby promoting a broader culture of digital scholarship and lifelong learning beyond the physical library environment.

Collectively, these studies underscore the importance of information literacy in enhancing technology utilisation within library settings. However, existing research has primarily examined information literacy in relation to library service delivery, user education, resource utilisation, or technology adoption independently, with relatively limited attention to its relationship with librarians' use of cloud computing technologies. Moreover, many previous studies have focused on students and other information users or have been conducted outside university library contexts, thereby limiting the applicability of their findings to professional librarians. Consequently, librarians who possess strong information literacy competencies are better equipped not only to utilise cloud computing technologies effectively but also to support students and faculty in navigating cloud-enabled information resources, thereby promoting digital scholarship and lifelong learning.

### *2.3 Librarians' Digital Literacy Skills and their Use of Cloud Computing Technologies in University Libraries*

The growing adoption of cloud-based systems for data storage, management, and access in universities has heightened the importance of librarians' digital literacy skills. Digital literacy encompasses the competencies required to effectively access, analyse, create, and communicate information using digital technologies. These skills are indispensable for librarians who interact with diverse cloud computing platforms such as Google Drive, Microsoft OneDrive, and institutional repositories.

Digital competence has evolved beyond basic computer skills to encompass the confident, critical, and responsible use of digital technologies for learning, work, and participation in society. The European Commission's Digital Competence Framework for Citizens (DigComp 2.2) conceptualises digital competence as the confident, critical, and responsible use of, and engagement with, digital technologies across these contexts and identifies five competence areas: information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving (Vuorikari et al., 2022). Similarly, Law et al., (2018) describes digital literacy as the ability to access, manage, understand, integrate, communicate, evaluate, and create information safely and appropriately through digital technologies for effective participation in knowledge societies. These internationally recognised frameworks provide a conceptual basis for understanding why librarians require advanced digital literacy skills to effectively adopt and utilise cloud computing technologies in contemporary university libraries.

Empirical and theoretical literature consistently highlight the critical role of digital literacy in enhancing librarians' effectiveness in cloud environments. Digital literacy equips librarians with the competencies required to curate digital content, facilitate user engagement, and effectively utilise cloud-based systems in academic libraries. Similarly, studies on cloud computing adoption in academic

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libraries have shown that continuous professional development and technology-oriented training enhance librarians' capacity to effectively utilise cloud computing technologies for resource sharing, research support, and improved service delivery (Tella et al., 2020; Ijeh et al., 2022). These findings suggest that technology training strengthens both the technical and pedagogical competencies required for effective cloud-based library services.

Complementing these findings, Setiyawan, Suharno, and Pambudi (2023) demonstrated that digital literacy and information literacy jointly and significantly influenced students' learning outcomes, with digital literacy contributing substantially to performance variance. Although Setiyawan, Suharno, and Pambudi (2023) focused on students rather than librarians, their findings provide indirect evidence that digital literacy enhances effective engagement with technology-based environments. Given that librarians undertake more specialised digital information management responsibilities than students, the study cannot be directly generalised to librarians; nevertheless, it provides valuable theoretical support for examining similar relationships among library professionals.

Contemporary scholarship underscores the evolving nature of digital literacy in response to rapid technological advancements and the digital transformation of library services. In this context, continuing professional development has become essential for equipping librarians with the digital competencies required to adapt to emerging technologies and changing professional responsibilities. Nakaziba and Ngulube (2025) identified mentoring, networking, collaboration, workshops, conferences, e-learning, and short courses as effective strategies for strengthening librarians' digital competencies. The authors further emphasized that institutional support through continuing professional development policies, dedicated personnel, and sustainable funding is critical for maintaining librarians' digital capacity and ensuring their preparedness for digital transformation.

Taken together, the reviewed literature indicates that the continuous development of digital competencies is essential for librarians operating in increasingly technology-driven environments. The studies, however, adopt different perspectives, emphasizing various dimensions of digital competence, including continuing professional development, digital skills acquisition, user support, and technology-enabled service delivery. This diversity underscores the multidimensional nature of digital literacy and suggests that no single perspective sufficiently explains librarians' adoption and utilization of cloud computing technologies. Instead, these competencies should be viewed as complementary capabilities that collectively enhance librarians' capacity to leverage cloud computing for effective information service delivery.

Ongoing professional development is another critical dimension linking digital literacy to cloud computing adoption. Given the rapidly evolving digital landscape, continuous professional development enables librarians to acquire and update the digital competencies required to effectively utilise cloud-based technologies and support users in navigating increasingly complex digital information environments. Such continuous learning is particularly important for strengthening librarians' ability to promote information credibility and digital scholarship. Furthermore, digitally literate librarians are better positioned to utilise cloud platforms to develop personalised resource guides, tutorials, and other digital learning resources that enhance users' ability to critically evaluate information sources and support academic integrity.

Furthermore, digital literacy enhances librarians' capacity to collaborate effectively within

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cloud-based environments. The successful utilization of cloud computing technologies in academic libraries depends not only on the availability of adequate technological infrastructure but also on librarians' digital competencies, technological readiness, and continuous professional development, which collectively facilitate the adoption and effective use of cloud-based library services (Tella et al., 2020; Nakaziba & Ngulube, 2025). By strengthening these competencies, librarians are better equipped to support technology-enabled library services, foster collaboration among users, and contribute to improved teaching, learning, and research outcomes.

Additional empirical support is provided by Adejo (2024), who examined the use of cloud computing technologies among librarians at the University of Nigeria, Nsukka. The study revealed that cloud computing was predominantly utilised for cataloguing, metadata management, storage, and information retrieval, with Software as a Service (SaaS) being the most commonly used model. Although limited by a small sample size, the findings illustrate the practical applications of cloud technologies in library operations and reinforce the need for adequate digital literacy to optimise their use.

Although previous studies consistently demonstrate the importance of digital literacy for technology adoption, many have focused on specific aspects such as user education, digital content management, collaborative learning, or institutional training. Consequently, there remains limited empirical evidence examining digital literacy as a direct predictor of librarians' use of cloud computing technologies within university libraries, particularly in developing countries where technological infrastructure and institutional support differ considerably from those in developed nations.

Overall, the reviewed literature demonstrates that digital literacy skills are indispensable for the effective adoption and utilisation of cloud computing technologies in university libraries. These competencies enhance operational efficiency, support teaching and research, and improve digital service delivery. Nevertheless, existing studies have largely examined digital literacy in relation to general technology use, educational outcomes, or library service provision, with relatively few studies investigating its specific influence on librarians' use of cloud computing technologies. Furthermore, limited empirical evidence exists within university libraries in Delta State, Nigeria, where contextual factors may shape technology adoption differently. This study addresses this gap by examining digital literacy skills as a correlate of librarians' use of cloud computing technologies, thereby contributing to a more comprehensive understanding of technology adoption in academic library settings.

### 3. Research Methodology

Correlation research design was adopted for the study as it seeks to examine the relationships between variables as it allows researchers to collect data on multiple variables simultaneously while establishing a relationship without manipulating any independent variables (Cohen et al., 2018). The correlational design was considered appropriate because it allows for the investigation of relationships among variables without manipulating them, thereby enabling the establishment of the nature and strength of associations among the variables of interest. The design was also considered suitable because the study sought not only to determine the relationships among the variables but also to

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examine the combined predictive influence of information literacy skills and digital literacy skills on librarians' use of cloud computing technologies through multiple regression analysis. The study was carried out in Delta State, located in the Niger Delta region of Nigeria, an area characterised by a mix of federal, state, and private universities with varying levels of ICT infrastructure and digital library development. The population of the study comprised all 157 librarians working in the ten university libraries in Delta State. Given the manageable size of the population, a census approach was adopted and no sampling technique was employed. Data were collected using three research instruments developed from relevant literature: the Cognitive Ability Test of Librarians' Information Literacy Skills (CATLILS), the Cognitive Ability Test of Librarians' Digital Literacy Skills (CATLDLS), and the Use of Cloud Computing Technologies Questionnaire (UCCTQ). CATLILS was designed to measure librarians' competencies in identifying information needs, locating, evaluating, organizing, and ethically using information resources. CATLDLS measured librarians' competencies in the effective use of digital technologies, including the ability to access, create, communicate, and manage digital information using various digital platforms. The UCCTQ was designed to measure the extent to which librarians utilized cloud computing technologies for library operations and service delivery, including information storage, retrieval, collaboration, resource sharing, and communication. Both CATLILS and CATLDLS consisted of 20 multiple-choice items with four response options (A-D) from which respondents selected the correct answer. Each correct response attracted one mark and was subsequently converted to a percentage score, giving a maximum obtainable score of 100. The UCCTQ also contained 20 items measured on a five-point Likert scale ranging from Very Often (5) to Not at all (1). The total score obtained by each respondent represented his or her level of use of cloud computing technologies, with higher scores indicating greater utilization. The instruments were subjected to face and content validation by three experts. The validators examined the instruments for clarity of language, relevance of items to the study objectives, adequacy of content coverage, appropriateness of item construction, and alignment with the study variables. Their observations and recommendations were incorporated before the final administration of the instruments. The reliability of CATLILS and CATLDLS was established using the Kuder-Richardson Formula 20 (KR-20) following a pilot test conducted among 20 librarians from the University of Benin, Edo State. Reliability coefficients of 0.85 and 0.82 were obtained for CATLILS and CATLDLS respectively, indicating high internal consistency. The reliability of the UCCTQ was determined using the Cronbach's alpha method, yielding a coefficient of 0.77, which was considered acceptable for research purposes. According to DeVellis (2016), a Cronbach's alpha value above 0.70 is generally considered acceptable for research purposes, and the obtained value underscored the reliability of the constructed questionnaire. Data collection was carried out over a four-week period with the assistance of four research assistants. Ethical considerations were strictly observed, including informing participants about the purpose of the study, obtaining informed consent, and assuring confidentiality and anonymity of responses. Out of the 157 copies of the instruments administered, 122 were retrieved, representing a 77% response rate. The response rate was considered adequate for statistical analysis and sufficiently representative of the study population. Although 35 librarians did not return their instruments, the use of a census approach and the relatively high retrieval rate minimized the likelihood of non-response bias and enhanced the representativeness of the findings. Data were

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analysed using Pearson Product Moment Correlation to answer the research questions and test the corresponding hypotheses at the 0.05 level of significance. Pearson Product Moment Correlation was used to determine the nature and strength of the relationships between the independent variables (information literacy skills and digital literacy skills) and the dependent variable (use of cloud computing technologies). Regression analysis was further employed to determine the combined predictive influence of information literacy and digital literacy skills on librarians' use of cloud computing technologies. The regression analysis further determined the relative contribution of each predictor variable through the standardized beta coefficients ( $\beta$ ), while the coefficient of determination ( $R^2$ ) was used to determine the proportion of variance in librarians' use of cloud computing technologies jointly explained by the predictor variables. Decisions on hypotheses were based on probability values, with null hypotheses rejected where the  $p$ -value  $\leq 0.05$ .

## 4. Results

In this part, the result of the analysis and discussion of the findings are presented. The presentation of result and discussion of findings are done in line with the research questions and hypotheses.

### 4.1 Research Question 1: What is the relationship between librarians' information literacy skills and their use of cloud computing technologies in university libraries in Delta State?

Table 1. Pearson  $r$  on Relationship between Librarians' Information Literacy Skills and their Use of Cloud Computing Technologies in University Libraries in Delta State

| Source of Variation                     | n   | R     | Remark                          |
|-----------------------------------------|-----|-------|---------------------------------|
| Librarians' Information Literacy Skills | 122 | 0.853 | Very High Positive Relationship |
| Use of Cloud Computing Technologies     |     |       |                                 |

Data presented in Table 1 indicate a very high positive relationship between librarians' information literacy skills and their use of cloud computing technologies in university libraries in Delta State ( $r = 0.853$ ). This finding suggests that librarians with higher information literacy skills tend to make greater use of cloud computing technologies in their professional activities.

### 4.2 Research Question 2: What is the relationship between librarians' digital literacy skills and their use of cloud computing technologies in university libraries in Delta State?

Table 2. Pearson's Correlation( $r$ ) on Relationship between Librarians' Digital Literacy Skills and their Use of Cloud Computing Technologies in University Libraries in Delta State

| Source of Variation                 | n   | R     | Remark        |
|-------------------------------------|-----|-------|---------------|
| Librarians' Digital Literacy Skills | 122 | 0.681 | High Positive |

Use of Cloud Computing  
Technologies

Relationship

Data in Table 2 reveal a high positive relationship between librarians' digital literacy skills and their use of cloud computing technologies in university libraries in Delta State ( $r = 0.681$ ). The result indicates that improvements in librarians' digital literacy skills are associated with increased use of cloud computing technologies.

*4.3 Research Question 3: What is the joint correlation of librarians' information literacy skills and digital literacy skills with their use of cloud computing technologies in university libraries in Delta State?*

Table 3. Summary of Multiple Regression Analysis of Information Literacy Skills and Digital Literacy Skills as Correlates of Librarians' Use of Cloud Computing Technologies in University Libraries in Delta State, Nigeria

| R    | R <sup>2</sup> | Adjusted R <sup>2</sup> | Remark                     |
|------|----------------|-------------------------|----------------------------|
| 0.67 | 0.449          | 0.439                   | High Positive relationship |

Table 3 shows a high positive multiple relationship ( $R = 0.670$ ) between librarians' information literacy skills, digital literacy skills, and their use of cloud computing technologies in university libraries in Delta State. The coefficient of determination ( $R^2 = 0.449$ ) indicates that information literacy skills and digital literacy skills jointly explained 44.9% of the variance in librarians' use of cloud computing technologies, while the remaining 55.1% of the variance may be attributed to other factors not included in the study. Furthermore, the adjusted  $R^2$  value of 0.439 indicates that, after adjusting for the number of predictor variables included in the model, approximately 43.9% of the variance remained explained by the model.

*4.4 Tests of Hypotheses*

H01: There is no significant relationship between librarians' information literacy skills and their use of cloud computing technologies in university libraries in Delta State.

Table 4. Test of Significance of Pearson Correlation between Librarians' Information Literacy Skills and their Use of Cloud Computing Technologies in University Libraries in Delta State

| Source of Variation                 | n   | r     | p-value | Remark |
|-------------------------------------|-----|-------|---------|--------|
| Librarians' Information Literacy    | 122 | 0.853 |         |        |
| Use of Cloud Computing Technologies |     |       | 0.000   | Sig    |

Table 4 indicates that there is a statistically significant relationship between librarians' information literacy skills and their use of cloud computing technologies in university libraries in Delta State ( $r = 0.853$ ,  $p < 0.001$ ). Since the p-value is less than the 0.05 level of significance, the null hypothesis

was rejected. This implies that information literacy skills are significantly related to librarians' use of cloud computing technologies.

H02: There is no significant relationship between librarians' digital literacy skills and their use of cloud computing technologies in university libraries in Delta State.

Table 5. Test of Significance of Pearson Correlation between Librarians' Digital Literacy Skills and their Use of Cloud Computing Technologies in University Libraries in Delta State

| Source of Variation                 | n   | R     | p-value | Remark |
|-------------------------------------|-----|-------|---------|--------|
| Librarians' Digital Literacy        | 122 | 0.681 |         |        |
| Use of Cloud Computing Technologies |     |       | 0.000   | Sig    |

Table 5 shows that there is a statistically significant relationship between librarians' digital literacy skills and their use of cloud computing technologies in university libraries in Delta State ( $r = 0.681$ ,  $p < 0.001$ ). Since the p-value is less than the 0.05 level of significance, the null hypothesis was rejected. Therefore, digital literacy skills are significantly related to librarians' use of cloud computing technologies.

H03: There is no significant joint correlation of librarians' information literacy skills and digital literacy skills with their use of cloud computing technologies in university libraries in Delta State.

Table 6. Summary of Multiple Regression Analysis of Information Literacy Skills and Digital Literacy Skills as Predictors of Librarians' Use of Cloud Computing Technologies in University Libraries in Delta State

| N   | R     | R <sup>2</sup> | Adjusted R <sup>2</sup> | F      | df    | p-value | Decision    |
|-----|-------|----------------|-------------------------|--------|-------|---------|-------------|
| 122 | 0.670 | 0.449          | 0.439                   | 48.485 | 2,119 | 0.000   | Significant |

Table 6 shows that the multiple regression model was statistically significant ( $F(2,119) = 48.485$ ,  $p < 0.001$ ). Since the p-value is less than the 0.05 level of significance, the null hypothesis was rejected. This indicates that information literacy skills and digital literacy skills jointly exert a significant predictive influence on librarians' use of cloud computing technologies in university libraries in Delta State. The coefficient of determination ( $R^2 = 0.449$ ) further indicates that the two predictor variables jointly explained 44.9% of the variance in librarians' use of cloud computing technologies, while 55.1% of the variance was attributable to other factors outside the model.

Table 7. Regression Coefficients Showing the Relative Contributions of Information Literacy Skills and Digital Literacy Skills to Librarians' Use of Cloud Computing Technologies in University Libraries in Delta State

| Predictor Variables         | B     | St. Error | $\beta$ (Beta) | T     | p-value | Decision        |
|-----------------------------|-------|-----------|----------------|-------|---------|-----------------|
| Constant                    | 5.201 | 2.786     | –              | 1.863 | 0.065   | Not Significant |
| Information Literacy Skills | 0.424 | 0.052     | 0.683          | 8.404 | 0.000   | Significant     |

|                                                                     |       |       |       |       |       |             |
|---------------------------------------------------------------------|-------|-------|-------|-------|-------|-------------|
| Digital Literacy Skills                                             | 0.211 | 0.063 | 0.339 | 3.501 | 0.000 | Significant |
| Dependent Variable: Librarians' Use of Cloud Computing Technologies |       |       |       |       |       |             |

Data presented in Table 7 reveal that both information literacy skills ( $\beta = 0.683$ ,  $t = 8.404$ ,  $p < 0.001$ ) and digital literacy skills ( $\beta = 0.339$ ,  $t = 3.501$ ,  $p < 0.001$ ) made significant positive contributions to librarians' use of cloud computing technologies in university libraries in Delta State. However, information literacy skills contributed more strongly to the prediction of librarians' use of cloud computing technologies than digital literacy skills, as indicated by the higher standardized beta coefficient ( $\beta = 0.683$ ). This suggests that improvements in librarians' information literacy skills are likely to have a greater influence on the adoption and use of cloud computing technologies than improvements in digital literacy skills alone.

## 5. Discussion of Findings

The finding of the study as gleaned from Table 1 revealed that a very high positive relationship existed between librarians' information literacy skills and their use of cloud computing technologies in university libraries in Delta State. This means that the more information literate a librarian is, the greater the tendency for them to use cloud computing technologies in university libraries. In other words, information literacy skills provide the librarians with the requisite knowledge and self-efficacy to use cloud computing technologies to the benefit of library patrons. The very high correlation ( $r = 0.853$ ) suggests that information literacy is a critical competency underpinning librarians' ability to identify, evaluate, organize, retrieve, and effectively utilize cloud-based information resources. As university libraries increasingly depend on cloud computing technologies to support digital collections, institutional repositories, and collaborative information services, librarians with stronger information literacy skills are more likely to perceive these technologies as useful and integrate them into their daily professional activities. This finding is consistent with the Performance Expectancy construct of the Unified Theory of Acceptance and Use of Technology (UTAUT), which posits that individuals are more likely to adopt technologies when they believe such technologies will enhance their job performance.

The findings of the current study are in consonance with those of Ekong and Ekong (2018), who found that information literacy skills influenced the use of e-library resources in tertiary institutions in Akwa Ibom State. This suggests that librarians' information literacy competencies play a critical role in facilitating the effective utilisation of digital technologies within library environments. The finding also reinforces the view that information-literate librarians are better equipped to evaluate, organise, and apply digital information resources, thereby enhancing their capacity to utilise cloud computing technologies effectively. As university libraries continue to transition from traditional service models to cloud-enabled environments, information literacy has become an indispensable competency for managing digital resources, supporting collaborative services, and improving information access. The significant relationship obtained in the present study further corroborates the finding of Adeleke and Emeahara (2016), who reported that information literacy competence significantly influenced the academic use of electronic resources, suggesting that stronger information



literacy competencies encourage greater utilisation of digital information systems.

The finding of the study as gleaned from Tables 2 and 5 revealed that a high positive and significant relationship existed between librarians' digital literacy skills and their use of cloud computing technologies in university libraries in Delta State. Put differently, the higher the digital literacy, the greater the likelihood of adoption of cloud computing technologies by librarians in the university library. This could be attributed to the fact that a digitally literate librarian is more likely to possess a favourable disposition towards the use of cloud computing technologies. The high positive relationship ( $r = 0.681$ ) indicates that digital literacy equips librarians with the competencies required to effectively operate cloud-based platforms, manage digital resources, and provide technology-driven library services. The finding further supports the Effort Expectancy construct of the UTAUT, which suggests that individuals are more inclined to adopt technologies that they perceive as easy to learn and use. Librarians with stronger digital literacy skills are therefore likely to experience fewer challenges in using cloud computing technologies, resulting in greater adoption and utilization.

The findings of the present study support the view that librarians require strong digital competencies to effectively support users in navigating contemporary digital information environments. As academic libraries increasingly depend on digital technologies, librarians' ability to evaluate, manage, and provide guidance on digital information resources has become essential for effective information service delivery (Nakaziba & Ngulube, 2025; Ogunbodede & Atchrimi, 2024). Consequently, the importance of digital literacy skills among university librarians in facilitating the effective use of cloud computing technologies cannot be overemphasized. Similarly, librarians' ability to function effectively in technology-driven library environments depends on the continuous development and enhancement of digital competencies. Academic librarians require digital skills and digital pedagogical knowledge to support technology-enabled information services and respond effectively to evolving user needs (Saib et al., 2022). Furthermore, continuous professional development, supported by institutional policies, structured training opportunities, and other capacity-building initiatives, is essential for strengthening librarians' competencies and preparing them for digital transformation (Nakaziba & Ngulube, 2025). These competencies not only enhance librarians' capacity to provide reliable and effective information services but also contribute to maintaining research integrity and supporting a productive academic environment. Moreover, cloud computing facilitates collaboration within libraries and across academic departments. Equipped with adequate digital literacy skills, librarians can effectively support the integration of cloud-based tools, promote resource sharing, and contribute to the development of collaborative learning and research environments.

The findings from Tables 3, 6, and 7 revealed that information literacy skills and digital literacy skills jointly exerted a significant predictive influence on librarians' use of cloud computing technologies in university libraries in Delta State. The multiple regression analysis showed that the two predictor variables jointly explained 44.9% of the variance in librarians' use of cloud computing technologies, indicating that both competencies play important roles in influencing technology adoption among librarians. The remaining 55.1% of the variance may be attributed to other factors not examined in this study, such as organizational support, ICT infrastructure, facilitating conditions, institutional policies, management support, and individual technology-related attitudes.

The regression coefficients further revealed that although both information literacy skills ( $\beta =$

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0.683,  $p < 0.001$ ) and digital literacy skills ( $\beta = 0.339$ ,  $p < 0.001$ ) significantly predicted librarians' use of cloud computing technologies, information literacy skills made the stronger unique contribution to the prediction of cloud computing technology use. This finding suggests that while digital literacy enables librarians to competently operate cloud-based systems, information literacy provides the broader cognitive and analytical competencies required to effectively identify, evaluate, organize, and utilize digital information resources within cloud environments. Consequently, librarians who possess stronger information literacy skills are more likely to maximize the benefits of cloud computing technologies in supporting teaching, learning, research, and information service delivery.

## 6. Conclusion

The study established that information literacy skills and digital literacy skills are significantly associated with librarians' use of cloud computing technologies in university libraries in Delta State, Nigeria. The findings demonstrate that librarians with higher levels of information literacy and digital literacy are more likely to effectively utilise cloud computing technologies in library service delivery. These findings reinforce the importance of strengthening librarians' competencies as a means of promoting the effective adoption and utilisation of cloud computing technologies in academic libraries. Although this study provides valuable empirical evidence, it was limited to university libraries in Delta State, Nigeria. Consequently, the findings should be interpreted with caution when generalising to other geographical regions or other categories of libraries. Future research should examine additional organisational, technological, and environmental factors influencing librarians' use of cloud computing technologies in different institutional and geographical contexts.

## 7. Implications of the Study

The findings of this study have several theoretical and practical implications for university libraries and library professionals.

The finding that a very high positive relationship exists between librarians' information literacy skills and their use of cloud computing technologies implies that information literacy is a critical competency for the effective adoption and utilisation of cloud-based technologies in university libraries. Librarians with stronger information literacy skills are more likely to exploit cloud computing technologies to improve information management, resource sharing, and service delivery.

The study also revealed a high positive relationship between librarians' digital literacy skills and their use of cloud computing technologies. This implies that improvements in librarians' digital literacy skills are associated with increased utilisation of cloud computing technologies. Consequently, continuous capacity-building programmes in digital literacy are essential to enhance librarians' ability to effectively deploy cloud-based services in academic libraries.

Furthermore, the study established a high positive and significant joint relationship between librarians' information literacy skills and digital literacy skills and their use of cloud computing

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technologies. This implies that the two competencies collectively contribute to librarians' effective utilisation of cloud computing technologies. The finding further suggests that initiatives aimed at promoting cloud technology adoption in university libraries should integrate both information literacy and digital literacy development, as strengthening one competency without the other may limit the effective utilisation of cloud-based library services.

## 8. Recommendations

Based on the findings of the study, the following recommendations are made:

University library management should implement continuous professional development programmes to strengthen librarians' information and digital literacy skills, thereby enhancing the effective adoption and utilisation of cloud computing technologies.

University authorities and relevant professional bodies should support cloud computing adoption through sustained investment in ICT infrastructure, targeted training, and policies that promote digital competency development among librarians.

## Statements and Declarations

**Author Contributions:** Conceptualization, Author A; methodology, Authors A and C; data collection, Author B; formal analysis, Author B; writing, original draft preparation, Author B; writing, review and editing, Authors A and C; supervision, Authors A and C. All authors have read and approved the final version of the manuscript and agree to its publication.

**Funding:** This research received no external funding.

**Data Availability Statement:** The data supporting the findings of this study are available from the corresponding author upon reasonable request.

**Institutional Review Board Statement:** Not applicable.

**Informed Consent Statement:** Informed consent was obtained from all participants involved in the study.

**Conflicts of Interest:** The authors declare that they have no conflicts of interest.

**Generative AI Use Statement:** The authors used ChatGPT (OpenAI) solely to assist with grammar and language editing to improve the clarity and readability of the manuscript. The authors independently developed, verified, and approved all scientific content, including the study design, data analysis, interpretation of findings, and conclusions, and accept full responsibility for the accuracy and integrity of the manuscript.

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