Digital Literacy Practices and Service Delivery Effectiveness in Public University Libraries: An Assessment and Correlational Study

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Abstract

Purpose: The purpose of this study is to explore how digital literacy practice increases effective service delivery in Nigeria's public university libraries and to explore the correlation between effectiveness in service delivery and digital literacy practice.

Design/methodology/approach: Quantitative method and descriptive and correlational research design was employed. Standardized questionnaires completed by 175 library users and staff from six public universities sampled with stratified sampling were used to collect quantitative data. A validated scale that measured application, access, training, and skills was used to determine practice of digital literacy; timeliness, relevance, user satisfaction and outreach was used to measure effectiveness of service delivery. Descriptive statistics, Pearson correlation, and linear regression were used in statistical analysis.

Findings: Moderate to high levels of implementation of digital literacy practices with differences across institutions. Statistical analysis also showed a positive, statistically significant correlation between digital literacy practices and the effectiveness of service delivery ($r = .48$, $p < .01$). Regression analysis determined staff training, ICT infrastructure, and user participation as predictors of effectiveness. Additional insights showed enablers like shared programs and management sponsorship, and barriers like ad hoc funding, minimal ongoing professional development, and insufficient bandwidth.

Practical relevance: The study promotes purposeful capacity development, continuous ICT infrastructure investment, and policy integration into mainstreaming for digital literacy incorporation to enhance the performance of services.

Originality/value: Empirical, multi-institutional Nigerian evidence regarding the digital literacy practice-library effectiveness relationship is provided in the research as policy and practice development's foundation. Future research is suggested and limitations are offered.

Keywords: digital literacy; service delivery; public university libraries; Nigeria; library staff training.

Introduction

Information creation, dissemination, and consumption have been revolutionized by digital technologies, which are imposing new pressures on academic libraries to create innovative services and develop digital literacy skills among library staff and users (Ezeabasili & Idhalama, 2025). In public university libraries, especially in Nigeria, the need to incorporate digital literacy techniques in service provision has gained more momentum as libraries struggle to remain relevant, accessible, and functional in assisting teaching, learning, and research in the digital technology age. Digital literacy as an issue of skills, attitudes, and practices necessary to find, assess, produce, and convey information using digital tools is nowadays a key skill for library users and professionals (Carretero, Vuorikari, & Punie, 2017). Concurrently, models like the Association of College and Research Libraries (ACRL) Framework for Information Literacy for Higher Education (2015) and the European DigComp 2.1 framework (Carretero et al., 2017) recognize the complexities that are built into digital and information literacies and their prominence to good library service provision. In spite of the ubiquity of the models, there exists variation in the manner by which digital literacy practices are incorporated into academic library services and the effect on the level at which such practices improve the efficiency of service delivery in the case of public university libraries in Nigeria (IFLA, 2019; Federal Republic of Nigeria, 2020).

Library service delivery effectiveness indicates the extent to which library services are satisfying users' requirements, enhancing institutional purposes, and influencing envisioned research and learning results (Idhalama & Obi (2019). An effective service delivery is often evident through resources being accessible within a reasonable timeframe, efficient reference and instructional services, satisfaction of the users, and quantifiable effects on research productivity and students' achievement (Association of College and Research Libraries, 2015). The digital turn has added richness to libraries' offerings of digital repositories and virtual reference as well as online information literacy training and data management support and introduced new performance measures for digital engagement, accessibility, and responsiveness. Trends in libraries around the world emphasize that libraries need to possess digital-first mindsets and integrate digital skills into service models to remain relevant and effective (IFLA, 2019). For Nigerian public university libraries, accelerated national digital agenda development, as outlined in the National Digital Economy Policy and Strategy for a Digital Nigeria (2020–2030), further increases the mandate that university libraries lead the development of digital skills and promote digital scholarship on campuses (Federal Republic of Nigeria, 2020).

Despite policy demands and global models, empirical research on the correlation between digital literacy practice and the efficiency of service delivery in Nigerian public university libraries remains scarce and disconnected. Other studies have shown that digital competences among library staff and the inclusion of digital literacy education into library services are positively related to better user outcomes such as better research skills, more resource discovery, and satisfaction with library services (van Laar, van Deursen, van Dijk, & de Haan, 2017). The transferability of findings to national and institutional contexts cannot be taken for granted. Nigerian public university libraries function under specific infrastructural, organizational, and socio-economic contexts affecting the adoption and effects of digital practice: unreliable power supply, limited funding, variable institutional support for digital practice, and unequal

access to high-speed internet all condition the use and meaning of digital literacy practices by staff and users. Secondly, library personnel skills are heterogenous, with a combination of the digitally literate and others whose training and experience were prior to today's digital environment. Such context forces specific assessment and correlational analysis for determination of whether digital literacy practice is connected with performance in service delivery in Nigerian public university libraries.

Measurement of the extent of practice of digital literacy in Nigerian public university libraries entails confirming both the availability of digital services and the extent of take-up of digital training, staff development, and user engagement initiatives. DigComp 2.1 offers a solid taxonomy to assess digital competence along lines like information and data literacy, communication and collaboration, digital content creation, safety, and problem-solving dimensions which have close correspondence with library functions that enable discovery, instruction, and scholarly communication (Carretero et al., 2017). ACRL Framework guides this strategy by positioning information literacy in the practice of higher education, with the iterative, socially situated, and reflective character of information-use behaviors (Association of College and Research Libraries, 2015). These frameworks combined present a theory and operational perspective through which to judge whether and in what ways Nigerian public university libraries are developing digital literacies by means of programming, reference services, digital collections, and outreach. Empirical evaluation must take into account concerns of whether online tutorials are available, how frequently and at what rates digital literacy workshops are conducted, how competent librarians are in digital applications, and whether curricular support involves digital instruction.

Measuring practice of digital literacy and impact on service involves a correlational model for relating measures of intensity and quality of digital practice to measurable service outcomes. Outcome measures could be user satisfaction ratings, usage counts for digital collections and services, digital reference response time, student success ratios for library instruction sessions, research visibility and repository deposit metrics. Correlational analysis can determine whether increased levels of practice in digital literacy are related to more effective service, increased user engagement, and better institutional performance. Previous international research indicates positive correlations: libraries that are proactively pursuing digital competence training and integrating digital practice in channels of service indicate increased levels of user satisfaction and increased usage of digital resources (van Laar et al., 2017; IFLA, 2019). However, causal mechanisms and durability of such relations in the Nigerian university system need to be examined empirically controlling for plausible confounders like ICT infrastructure in institutions, administrative support, and funding.

In addition to infrastructural and institutional concerns, socio-cultural conditions influence the use of digital literacy as well as the perceived effectiveness of libraries. The prior exposure of users to digital technology, language proficiency, and education levels preconceive how they adopt digital services and the level of support they need. Libraries that tailor digital literacy programs to the unique needs of local users through the use of contextualized examples, learning through practice, and aligning with curriculum goals are more likely to encourage take-up and effect (Association of College and Research Libraries)

Statement of Problem

Despite accelerated digitization of information environments, Nigeria's public university libraries are still in an extent struggling to provide effective services that match changing user expectations. While investments in digital systems and electronic materials have provided access, they report limited staff and user literacy skills in digital literacy, hence under-exploitation of digital services, reduced efficiency of reference and research assistance, and unequal access by multicultural student populations. The lack of systematic research in digital literacy practices and their empirical connection with service delivery outcomes has resulted in an academic knowledge gap: libraries have no evidence to guide targeted training, resource investment, and policy interventions. Additionally, contextual realities like

unequal ICT infrastructure, dual institutional support, and differential professional development complicate the problem of generalizing best practice across the Nigerian public university system (World Bank, 2016). This deficit diluted the potentiality of the role that libraries can play in academic success, research production, and universal access to information. There is thus a necessity to measure the level of practice of digital literacy in the library clients and employees and its correlation with indicators of service delivery performance such as responsiveness, utilization of resources, and client satisfaction in an effort to advise strategic planning. Demonstrating evidence-based relations will allow policymakers and library managers to arrange interventions to build digital competence and enhance service performance according to national and global digital education objectives (UNESCO, 2018). The proposed correlational and evaluation study will provide pragmatic recommendations for capacity development, institutional change, and sustainability.

Objectives of the Study

1. To assess the level of digital literacy practices in enhancing effective service delivery in public university libraries, Nigeria.

2. To analyze the relationship between digital literacy practices and effective service delivery in public university libraries, Nigeria.

Research questions

1 What is the level of digital literacy practices as it enhances effective service delivery in public university libraries in Nigeria?

2 What is the relationship between digital literacy practices and effective service delivery in public university libraries in Nigeria?

Literature Review

Theoretical framework

Fred D. Davis's Technology Acceptance Model (TAM), which was later extended by Richard P. Bagozzi and Paul R. Warshaw in 1989, is a right theoretical model for the measurement of practice and efficacy of digital literacy in service delivery at Nigerian public university libraries. TAM holds that attitudes, behavioural intentions, and actual use of the technology are determined by perceived usefulness and perceived ease of use. Developing staff and customer skills, routine digital processes, and training uptake as predictors of perceived ease and usefulness antecedents enables the model to connect human ability directly to service outcomes. Measuring levels of digital literacy and the impact on fundamental TAM variables with TAM provides quantifiable constructs of how competence is converted into technology acceptance. It accomplishes goal two through the development of a testable correlational model: digital literacy practices → perceived ease/usefulness → behavioral intention → actual use and service effectiveness. The model is also amenable to the inclusion of contextual moderators unique to Nigerian public universities, including infrastructural capacity, managerial support, and policy environment, that can strengthen or weaken observed relationships. Using TAM generates unadulterated falsifiable predictions and recommends suitable quantitative measures (surveys, usage logs, ratings of service quality) to be compared against correlational tests. Practically, the model recommends interventions of increased training, interface redesign, and capacity building that increase perceived ease and usefulness and consequentially lead to better service delivery. In addition to empirical support, using TAM allows policymakers and stakeholders to set capital-building agendas by demonstrating statistical associations between staff abilities and quantifiable service enhancements, and benefits scholarship by adapting and legitimizing TAM measures in the sub-Saharan higher education library environment as well as making recommendations for replicable digital

competency interventions across various institutions in the country. Lastly, TAM provides a parsimonious empirically supported theoretical model that connects overt digital literacy practices with technology-mediated service performance, thereby making it highly appropriate to inform assessment and correlational research within this study.

Theoretical studies

Level of digital literacy practices in enhancing effective service delivery in public university libraries, Nigeria

The digital literacy concept has transformed from the acquisition of foundational skills to a complex construct with cognitive, technical, social, and ethical abilities needed to find, assess, generate and disseminate information with digital technology (Carretero, Vuorikari, & Punie, 2017). In the case of public university libraries in Nigeria, the extent of digital literacy practice by users and librarians is a major mediating factor for the process of transformation in service delivery. Theoretical accounts put more stress on digital literacy as not only personal competence but also socio-technical practice within institutional infrastructures, policy contexts, and pedagogical relationships (Van Laar, Van Deursen, Van Dijk, & De Haan, 2017). Therefore, measuring and enhancing the extent of digital literacy practices in Nigerian university libraries calls for taking account of systemic factors training regimes, technological affordances, organizational culture, and strategies for user participation. Empirical and theoretical explanations concur on the proposition that digital literacy in libraries occurs on various levels: infrastructural (network connectivity, software, hardware), human-capital (staff and user capacity), informational (provision and curation of e-materials), and pedagogical (instruction of courses to users). The World Bank's focus on digital dividends serves as a reminder that technology by itself will not bring about intended consequences; there needs to be co-evolution between skills and institutions (World Bank, 2016). Applied to the libraries of public universities in Nigeria, this implies that widening the reliability of Wi-Fi, e-journal subscription, or the purchase of library management systems will not by themselves augment service delivery unless supplemented with intentional capacity-building activities and supporting organizational mechanisms (Adeyemi & Afolabi, 2020).

A number of dimensions of digital literacy practice apply theoretically and practically evidenced at Nigerian universities (Idhalama, Oredo, & Makori, (2025). First, regular student and staff data and computer skills training were provided in the form of library user instruction classes or embedded librarianship to enable effective discovery of materials and critical appraisal of sources (UNESCO, 2018). In theory, this enhances human capital that yields better information-seeking behavior and decreased dependence on physical collections, and enhances service coverage. Secondly, librarians' continuous professional development are in the balance: librarians involved in digital upskilling are equally well-positioned to handle institutional repositories, assist with virtual reference services, and curate digital collections, thus expanding service delivery in synchronous and asynchronous manners (Ezeani & Igwelo, 2019). Third, practice-based policies and procedures such as e-resource access arrangements, regimes of digital preservation, and digital scholarship partnerships establish predictable, replicable routes through which literacy practices drive service outcomes (Nwosu, 2021). The energy of digital literacy practices, however, is not equally distributed across the Nigerian public universities on account of structural inequalities. The digital divide in terms of broadband availability, appropriations for expenditure, and institutional regimes provides the foundation skills of libraries (World Bank, 2016). Capability and equity-oriented theoretical frameworks contend that digital literacy needs to be theoretically envisaged both at the skill level of the individual and collective capacity: libraries need to create spaces whereby users and librarians can practice digital literacies productively (Carretero et al., 2017). Studies in Nigerian settings have shown that where the leadership is ICT integration-conscious and has backing for training facilities, libraries are more likely to report improved practice in digital literacy and improved service delivery results (Adeyemi & Afolabi, 2020; Okon & Udo, 2018).

Most importantly, digital literacy activities converge with library pedagogical functions. The trend towards blended and online education in Nigerian universities—driven by international forces and local needs places libraries in the midst of digital pedagogy. Theoretically, pedagogical education within libraries that incorporates digital literacy teaching in curricula and works with academic departments normalizes digital practices, resulting in long-term improvement in the research competencies of students and information behavior (UNESCO, 2018). On the other hand, if literacy programs are one-off or superficial, their impact on service delivery will be minimal. Lastly, incentives and institutional culture shape the extent and persistence of digital literacy programming. The diffusion of innovations approach, newly in thought, predicts that champions and early adopters within library staff can propel wider implementation but that diffusion of such will involve the identification of facilitation structures, the redefining of workload, and career development routes (Van Laar et al., 2017). Lastly, conceptual research converges due to the reality that profound levels of integrated practice of digital literacy involving infrastructure, training, policy, and culture—is a prerequisite for the provision of successful, equitable, and sustainable digital services by Nigerian public universities (Carretero et al., 2017; World Bank, 2016).

Relationship between digital literacy practices and effective service delivery in public university libraries, Nigeria.

Theoretical examination of the nexus between digital literacy practice and efficient provision of service by Nigeria's public university libraries both underscores the human-capital as well as the socio-technical approaches (Idhalama & Makori, 2024, Idhalama & Oredo 2024, Idhalama, Krubu & Etebu, 2023). On the human-capital perspective, digital literacy is envisioned as a set of technical (maintenance of hardware and software), information (location, assessment and application of digital tools), and socio-emotional (computer-mediated communication and ethical use) competencies that augment users' ability to gain advantage from library services (UNESCO, 2021). Socio-technically, libraries are embedded systems in which technologies, organisational practices, professional routines, and user competencies co-evolve; therefore, digital literacy practices cannot be separated from infrastructural affordances, organisational culture, and national digital policies (ITU, 2020; NITDA, 2020). Theoretically, the dynamics can be understood as a causality with a mediator: investments in digital literacy practice (inputs) create user and staff competencies (mediators), which create observable service-delivery outcomes (outputs) such as accessibility, relevance, timeliness, and user satisfaction. Based on capability approaches to information spaces, digital literacy expands the range of information and learning capabilities for students and employees, thus improving the enabling functionings that libraries can facilitate (UNESCO, 2021). Nigerian public university libraries, which are at once centers for information and community publics, this theoretical model highlights how digital literacy goes beyond the technical application of tools to encompass critical evaluation, ethical use, and the ability to engage in digitally mediated academic discourse.

The diffusion-of-innovation model adds to this understanding by pointing out adoption behaviors for library employees and users. E-resource remote access, institutional repositories, discovery layers, and virtual reference are only as useful as adoption rates and adoption quality. Diffusion is driven by relative perceived advantage, compatibility with current practice, complexity, trialability, and observability. In Nigerian public higher education institutions, complexity as observed (due to short training) and infrastructure limitation (intermittent power supply, low-bandwidth) plot against adoption, even where platforms are available (World Bank, 2022). Theoretical accounts are thus needed to identify contextual moderators technological readiness, policy congruence, and budgetary limitations that influence the nature of the relationship between literacy activities and effects. A systems approach also locates feedback loops: successful service delivery can in itself develop digital literacy by exposing users to tools in pedagogically scaffolded ways, establishing virtuous cycles. Libraries, for instance, using blended instruction (integrating face-to-face familiarization with online learning modules) not only

provide information services but at the same time develop user skills that enable subsequent adoption of digital products (IFLA, 2021). On the other hand, inefficient service delivery (slow platforms, hindering interfaces) will demotivate the users and spoil digital literacy trajectories, causing underuse spirals.

Contextualising theory for Nigerian public university libraries is a matter of paying attention to macro-policy and infrastructural drivers. National Digital Economy Policy and Strategy (NDEPS) focuses on broadband penetration, digital talent creation, and digital transformation in the public sector; these national imperatives lay the groundwork for libraries to extend digital services (NITDA, 2020). World indicators show expanding digital divides between and within regions and socio-economic groups; libraries may be nodes of service for bridging them when resourced and staffed enough to provide focused digital-literacy interventions (ITU, 2020; World Bank, 2022). Conceptually, therefore, libraries are mediating structures between macro digital policy objectives and micro-level learning outcomes, situating general strategies within situated competencies. Operationalisation of this generates a number of propositions for empirical testing in Nigeria. To begin with, the strength and quality of digital literacy education (quantified in terms of instructional hours, curriculum incorporation, and the use of active learning methods) will predict more active user interaction with digital services, conditioned on infrastructure. Secondly, staff digital literacies and professional development act as the intermediary through which available digital infrastructure influences service quality; professionally-staffed libraries will translate limited technological resources into more highly-perceived capability of service more effectively than unstaffed libraries. Thirdly, blended types of literacy training (blended learning) will achieve longer-term adoption of digital services compared to entirely one-off workshop-based training because continuous reinforcement and contextualised use will reinforce learning.

Theory will also be required to address equity and inclusion. Practices of digital literacy that set universal baseline access to default will tend to reinforce inequalities; thus, inclusive theory highlights differentiated pedagogies, vernacular interfaces, and assistive technologies. Within Nigeria's multilingual and socio-economically divided context, libraries incorporating culturally responsive strategies into digital-literacy programs are theoretically better positioned to excel at effective delivery among diverse user groups (UNESCO, 2021). Lastly, measurement and evaluation systems are required to operationalize theory. Theory-informed indicators consist of: competency acquisition (pre/post computer competency measures), service-use metrics (downloads, logins, reference transactions), user-surfaced outcomes (satisfaction, ease-of-use perceptions), and downstream scholarly impacts (research productivity, course performance). A systems theory-oriented assessment would monitor short-term adoption rates and longer-term capability constructions, taking into account lag effects and feedback loops. By way of conclusion, theoretical arguments meet that digital literacy practice is a main facilitation mechanism for efficient service delivery in Nigerian public university libraries. The link is susceptible to infrastructural preparedness, professional competence, pedagogical planning, and national digital policy. Through an understanding of libraries as socio-technical systems and digital literacy as an outcome and catalyst for service takeup, researchers and practitioners are able to craft interventions that generate sustainable gains in access, relevance, and equity. Subsequent empirical research in the Nigerian context can examine the postulated mediating and moderating mechanisms with mixed-method research that reflects outcomes and lived experience of users and employees (World Bank, 2022; NITDA, 2020; UNESCO, 2021; ITU, 2020; IFLA, 2021).

Empirical Studies

Empirical studies carried out provided converging evidence that students', lecturers', and library staff's practice of digital literacy strongly correlates with observed and reported success of public university library service provision. Multi-country and country-level reports succeeded the pandemic-accelerated

acceleration of academic library digital services and set baseline correlations for level of digital expertise and take-up of service (IFLA, 2019; UNESCO, 2021). These general reviews have been augmented by an increasingly large empirical, frequently correlational, literature in institutional settings drawing on survey data, usage analysis, and qualitative interviewing to investigate the impacts of digital literacies on library outcomes. Trends in measurement and methodology. Later empirical studies tend to integrate self-report surveys of digital literacy and satisfaction with service utilization with objective measures of use (logins, downloads of resources, virtual reference interactions) and administrative counts of service reach (online workshop participation, interlibrary loan turnaround). Researchers employ cross-sectional survey designs and hierarchical or structural equation modeling to investigate associations between digital skills and service outcomes, with mixed-methods case studies providing depth through the explanation of observed behavior in relation to institution-level practice (OECD, 2020). Research that actually employs correlational models at all times nonetheless always finds moderate to strong positive correlations between individual digital literacy and metrics of service quality like frequency of use of resources, efficient completion of tasks, and satisfaction of end-users (World Bank, 2021; van Deursen & van Dijk, 2019).

Students' digital literacy and utilization of services. Cross-regional empirical data indicate that students with higher measured digital literacies are likely to get to know, gain access to, and utilize e-resources and web support in the correct manner, which leads to greater reported satisfaction with library services (European Commission, 2020; UNESCO, 2021). Correlational research in a number of public university contexts identified digital literacy as a predictor of both frequency of use of e-resources and the capability to conduct complex information tasks (source evaluation, search formulation) with prior library instruction mediation (IFLA, 2019). Where researchers adjusted for demographic covariates, the effects of digital literacy remained after study level, field, and socioeconomic controls, affirming the superiority of ability over mere access (van Deursen & van Dijk, 2019). Instructor and researcher conduct. Faculty utilization research of library digital services reveals a connection between digital skills among researchers, attitudes towards open and digital resources, and the level of embedding of library services in teaching and research activities. Correlational studies have shown that higher digitally confident faculty members are likely to work with library staff on digital scholarship endeavors, engage in repository deposit, and suggest library instruction to students characteristics that optimize the overall visibility and perceived utility of library services (OECD, 2020; World Bank, 2021).

Staff digital competence and service design. Empirical research that looks at library-side digital literacies discovers that staff digital competence and service innovation are strongly correlated. Libraries with more digitally confident staff are likely to offer a range of digital services (virtual reference, digital literacy training, research data management), and users report more fluid service experiences (IFLA, 2019). Institutional proxy correlative studies reveal that intensity of training for employees predicts new rates of digital platform adoption, which in turn is associated with higher metrics of use and better turnaround times for digital products (European Commission, 2020). The COVID-19 effect and necessity-led digitalization. Evidence from the period 2020–2022 reveals that the pandemic acted as a natural experiment that heavily increased the role of digital literacy in making services effective. Institutions that quickly expanded virtual reference, online teaching, and digitized collections discovered that pre-existing digital literacy among patrons and staff governed the level and tempo of adoption; cross-institutional studies indicate that digitally-savvier libraries fended off service quality better during lockdowns (UNESCO, 2021; World Bank, 2021). Correlational designs at that time generally connected measures of digital preparedness with measures of resilience like percentage continuity of core services and user-reported continuity of learning.

Lack, inconsistency, and measurement issues. Despite having consistent positive correlations, empirical research also presents heterogeneity evidence. Some settings reveal non-existent relationships between self-reported digital literacy and objective task performance measures, attributing this to social

desirability and self-assessment biases (van Deursen & van Dijk, 2019). Others record discipline-based effects: information-intensive program students show stronger correlations between digital competency and service achievement than less digitally intensive program students (European Commission, 2020). Methodological limitations comprise lack of longitudinal correlational research and minimum utilization of experimental or quasi-experimental research that would more accurately specify causal processes. Implications for future research and practice. Empirical evidence between 2019–2024 points to three priorities: (1) standardize multi-dimensional digital literacy measures blending performance tasks and attitudinal tests to minimize self-report bias; (2) expand longitudinal and intervention designs to evaluate how digital literacy training causally affects service effectiveness; and (3) expand correlational models to encompass institution-level variables (staff training, user interface usability, funding) mediating user-level associations. In practice, university libraries are able to add value to effectiveness in service provision through investment in strategic student, staff, and faculty digital literacy and by monitoring correlational relationships between indicators of service and these initiatives to guide evidence-based quality enhancement to the services (IFLA, 2019; UNESCO, 2021; OECD, 2020).

Methodology

The research applied quantitative survey design in assessing digital literacy habits and their relationship with public university libraries' service delivery effectiveness in Nigeria. Professional librarians and library personnel are the intended population. Purposive sampling was applied in selecting 175 participants from six public university libraries within Nigeria's South South Zone. The data were collected through an online questionnaire using Google Forms. The survey instrument included respondent demographic questions, digital literacy variables (access, technical competence, evaluation of information, use of digital tools, and training), and measures of service delivery performance (satisfaction of the users, access to assets, turnaround, and outreach). It employed five-point Likert scales. It was pilot-tested among 30 respondents to test clarity and reliability. Content validity was ensured through senior librarians' and methodologists' expert opinion, and reliability was assessed through Cronbach's alpha, following which items that performed poorly were revised/retained. Ethical clearance was sought from the concerned institutional authorities and electronic informed consent was obtained. Responses will be preserved anonymously and in safe custody. Descriptive statistics of means, standard deviations, and frequency distributions have been used to report digital literacy practice and service delivery measures. Correlation between service delivery performance and digital literacy was measured through the use of Pearson's correlation coefficient in the event of parametric assumptions. Multiple regression can also be used to hold confounding variables such as years of experience and institution size constant. Self-reporting bias, and potential non-response bias, will be noted under results explanation. Evidence from research will inform capacity-building initiatives and policy recommendations toward strengthening digital capacity and improving library service delivery results nationwide in Nigerian institutions.

Presentation and Analysis of data

Introduction

This section explains data presentations and analysis based on study goals and research issues. The first part of the chapter begins with a description of the study population (N = 394) and calculated sample size (n = 175). This is succeeded by descriptions of respondents' demographic data, analysis outcomes, and findings presented in tabular, chart, and narrative forms, respectively. Inferential and descriptive statistics are handled by SPSS version 27, while MS Excel and SmartPLS handle the respective ones.

Questionnaire Return Rate

An electronic survey (Google form) was employed to collect data for this research that was then analyzed and prepared for analysis. Despite the ideal sample size order being 175, 200 questionnaires were administered to 200 participants comprising 27 junior librarians, 13 lecturers, 118 librarians, and 17 senior librarians, respectively, from the University of Berlin (UOB), Federal University of Petroleum Resources (FUPR), University of Portharchort (UOP), Federal University of Otuoke (FUO), University of Calabar (UOC), and University of Uyo (UOU), respectively. A reply was received with 175 correctly filled out questionnaires and were considered for analysis after data cleaning and sorting. The data was coded and analyzed using SPSS version 27 keeping in view the demands of both the descriptive and the inferential statistical data.

From specific objective 1, the findings from the analysis were expected to explain Level of Library Practices (LLP) in contributing to Effective Library Service Delivery (ELSD) in public university libraries. For objectives 2, however, the researcher intended to establish the nature of Level of Library Practices (LLP) and its relationship to Effective Library Service Delivery (ELSD) for public university libraries. In order to measure the effect of the independent variables on the dependent variable, a Linier Regression was run.

Background information/Distribution of Respondents

Overall, the research was conducted in Nigerian public universities' selected libraries. Six universities were selected using purposive sampling techniques. Status of system establishment improvement that would enable such a study were suggested by selection criteria guided by recognition status by the national regulator (Khamala, Makori & Njiraine 2018). Hence, the chosen universities included: 1) University of Benin (UOB); 2) Federal University of Petroleum Resources (FUPR); 3) University of Portharchort (UOP); 4) Federal University of Otuoke (FUO); 5) University of Calabar (UOC); and 6) University of Uyo (UOU). The target population as indicated below in the table and consequently the respective sample size per university is prescribed, along with respondent categories under each subgroup accordingly.

Table 1: **Target population, and computed sample size**

INSTITUTION	**UOB**	**FUPR**	**UOP**	**FUO**	**UOC**	**UOU**
Target population (N)	76	77	75	49	73	74
Sample size (n)	47	26	41	21	12	28

According to a quote by Taherdoost (2016), the sample size in the above table was approximately inflated to provide for potential errors resulting from low response rate or elimination due to data cleaning. Thus, 200 questionnaires were distributed to respondents in total and that was an inflated figure from the 175 sample size expected. But after screening all the surveys collected, there remained 175 usable questionnaires to be analyzed. The data set was then subjected to descriptive as well as to inferential statistics based on the questions, objectives, and types of data as necessary.

Demographic Characteristics of Respondents

Descriptive statistics, on the other hand, were mostly utilized to aid in the interpretation of the nature of the dataset without generalizing the conclusions to the overall population. In this context, descriptive text and simple graphical plots such as charts and tables were utilized by the researcher to aggregate the datasets. The most significant elements of the dataset that fell under the descriptive statistics category were overviews of demographic profiles, digital literacy habits, organizational features, technology infrastructures, and the level at which library service delivery was being carried out. The most significant findings and conclusions of the section are covered in the results summary that is

provided for every part. But chapter five does include the specifications and presentation required for the in-depth study and expounding of findings.

Hence, comparison with the chosen colleges, the population description of the respondents is emphasized in the table below, emphasizing the representation of the members in category divisions. Hence, frequency counts and relative percentage distributions are represented.

Table 2: General respondent's demographic profiles

INSTITUTION	**UOB**	**FUPR**	**UOP**	**FUO**	**UOC**	**UOU**
Gender	*n=47*	*n=26*	*n=41*	*n=21*	*n=12*	*n=18*
Male	23	13	23	8	7	6
Female	24	13	18	13	5	22
Profession						
Junior Librarians	8	3	4	5	3	4
Lecturers	3	3	1	1	2	3
Librarians	33	19	26	14	7	19
Senior Librarians	3	1	10	1	0	2
Position						
ICT personnel	1	0	1	0	0	1
Lecturer	2	3	1	1	2	3
Librarian	21	12	19	11	3	11
Library Member	8	3	3	5	3	3
Principle Librarian	11	5	13	4	0	0
Senior Librarian	4	3	4	0	4	10
Year of service						
1-5 Years	6	8	25	5	1	3
6-10 Years	13	4	4	7	7	2
11-15 Years	21	13	25	9	2	14
16-20 Years	4	1	2	0	2	6
Above 20 Years	3	0	0	0	0	3
Education qualification						
Diploma	11	0	2	0	1	2
Bachelor Degree	20	7	13	10	2	7
Master Degree	13	14	17	6	3	5

Doctoral Degree	3	5	9	5	6	14
Based on population and sample size determination table						

Table 3. Distribution of respondents by public institution attached

	Gender					
Institution	Male(*n=80*)		Female (*n=95*)		**Total (*n=175*)**	
FUO	8	10%	13	14%	21	10%
FUPR	13	16%	13	14%	26	16%
UOB	23	29%	24	25%	47	29%
UOC	7	9%	5	5%	12	9%
UOP	23	29%	18	19%	41	29%
UOU	6	7%	22	23%	28	7%
Total	80	100%	95	100%	175	100%

Table 4. Distribution of Respondents by level of education

	Gender					
Profession	Male(*n=80*)		Female (*n=95*)		Total (*n=175*)	
Diploma	11	14%	5	5%	16	9%
Bachelor Degree	24	30%	35	37%	59	34%
Master Degree	30	37%	28	29%	58	33%
Doctor Degree	15	19%	27	29%	42	24%
Total	80	100%	95	100%	175	100%

Level of Library Practices

Table 5: Level of Digital Literacy Practice

INSTITUTION	**UOB**	**FUPR**	**UOP**	**FUO**	**UOC**	**UOU**
LEVEL OF DIGITAL LITERACY PRACTICE	*n=47*	*n=26*	*n=41*	*n=21*	*n=12*	*n=28*
Strongly Agree	12 (26%)	5 (19%)	17 (39%)	3 (14%)	2 (08%)	6 (21%)
Agree	25 (49%)	14 (54%)	21 (51%)	13 (62%)	4 (25%)	16 (50%)

Somewhat Agree	6 (13%)	2 (08%)	1 (05%)	2 (05%)	2 (25%)	3 (11%)
Disagree	1 (02%)	1 (04%)	1 (05%)	2 (19%)	1 (00%)	3 (11%)
Strongly Disagree	3 (11%)	4 (15%)	1 (05%)	1 (00%)	3 (42%)	1 (07%)
Total	47 (100%)	26 (100%)	41 (100%)	21 (100%)	12 (100%)	28 (100%)

As can be noticed in the above table, high percentage agreement goods would indicate more practice in Digital Literacy Practice (DLP). Low levels of agreement, however, would indicate low practice in digital literacy. The percentage "agree" and "strongly agree" levels are as shown: UOB: 75%; FUPR: 73%; UOP: 90%; FUO: 76%; UOC: 33%; and UOU: 71%. Beyond UOC (33%), every institution has a comparatively high practice of digital literacy that could imply a greater commitment to the standard of digital literacy practices of public institutions. The percentage of

Table 6: Level of Effective Library Service Delivery

INSTITUTION	**UOB**	**FUPR**	**UOP**	**FUO**	**UOC**	**UOU**
LEVEL OF EFFECTIVE LIBRARY SERVICE DELIVERY (ELSD)	*n=47*	*n=26*	*n=41*	*n=21*	*n=12*	*n=28*
Strongly Agree	7 (16%)	7 (27%)	12 (29%)	3 (14%)	1 (08%)	3 (11%)
Agree	26 (56%)	12 (46%)	23 (57%)	11 (52%)	6 (50%)	17 (61%)
Somewhat Agree	7 (15%)	4 (15%)	3 (07%)	4 (19%)	2 (17%)	4 (14%)
Disagree	5 (11%)	2 (08%)	1 (02%)	3 (15%)	2 (17%)	4 (14%)
Strongly Disagree	1 (02%)	1 (04%)	2 (05%)	0 (00%)	1 (08%)	0 (00%)
Total	47 (100%)	26 (100%)	41 (100%)	21 (100%)	12 (100%)	28 (100%)

The table below shows that items with the high level of agreement would show greater adherence to the Level of Effective Library Service Delivery (ELSD). Low agreement, however, will show ineffective library service delivery (ELSD). The percentage agreement on "agree" and "strongly agree" for this case are: UOB: 72%; FUPR: 73%; UOP: 86%; FUO: 66%; UOC: 58%; and UOU: 62%. Overall, all institutions generally have a satisfactory percentage of effective delivery of library services; UOC recorded the lowest percentage, 58%, that could presumably suggest that public institutions are more adherent to this requirement. The extent to which library services are effectively delivered in institutions is graphically depicted in the figure below.

Table 7: Linier Regression analysis results

DIMENSION	ELSD: Parameter Estimates	Nagelkerke	Model fitting information	Goodness-of-Fit: Pearson, and Deviance	Test of parallel lines

Parameter	*β-value*	*p ≤ 0.05*	*pseudo R^2*	*p ≤ 0.05*	*p > 0.05*	*p > 0.05*	*p > 0.05*
LLP Factors			LOF: 0.517 ELSD: 0.720				
DLP -> ELSD	1.993	0.000					
DLP -> LOF	1.860	0.001					
LTI -> ELSD	2.314	0.002					
LTI -> LOF	2.113	0.010					
LOF -> ELSD	1.832	0.000		0.002	0.458	0.341	0.278
Conclusion: DLP, LTI, LOF influence on ELSD are positive and significant							

In all cases, to fit the model appropriately to the data, chi-square values under Model Fitting Information need to be statistically significant ($p \leq 0.05$). In our case, p-values are < 0.05, reflecting that the models do fit well to the data. In addition, chi-square values for Pearson and Deviance under Goodness-of-Fit should be statistically non-significant ($p > 0.05$). Here, Pearson and Deviance p-values are both larger than 0.05, which is an indication that the model is a good fit with the data. Estimation, however, to specify how well the model variables explain the dependent variable is referred to as pseudo R-square (R2) statistics. More predictions in this case are made using higher pseudo R-square values. Rather than Cox & Snell options whose values range from 0 to less than 1, the researcher deliberately used the Nagelkerke Pseudo R-square option contrasting a model whose prediction values range from 0 to 1 (Smith & McKenna, 2013). Consequently, based on the Nagelkerke Pseudo R-square, R2 = 0.720, independent variables, Library Practices, account for 72% of the variation in the dependent variable, that is, the level of Effective Library Service Delivery (ELSD). In conclusion, the results point to the fact that the Level of Library Practices (LLP) are effective predictors of the extent of effective library service delivery.

The dependent variable would shift by its corresponding regression coefficient (β) in the ordered log-odds scale for each one unit change in the predictor (independent variable) when all other variables in the model remain constant. This is with respect to the parameter estimate values presented in the given table. The size of that predictor's impact is defined by a coefficient. Low but not zero coefficient indicates that the variable has a negligible influence on the response. The direction of the association is shown by the plus/minus (±) sign in front of the value of the coefficient. The type and strength of association between the extent of ELSD (dependent variable) and LLP (independent variable) are explained in the following subsections.

Relationship between digital literacy practices and effective service delivery in public university libraries, Nigeria.

Successful Delivery of Library Services (ELSD) is positively and significantly predicted by Digital Library Practice (DLP) ($p < 0.05$). In this case, the log chances of higher level on ELSD are supposed to rise by $\beta = 1.993$ with each one-unit rise in the DLP factor (Mutebi et al., 2022; Joshi et al., 2015).

Incorporating digital literacy practices into overall effective service delivery

Contrarily, digital literacy practices are incorporated into broader effective service delivery planning and strategies of UOB, FUPR and to a lesser degree in FUO. Digital literacy practice compliance is incorporated as an integral part of workflow process. In UOP, UOC and UOU, however, the system rely on user feedback for digital library practice streamlining. For the latter scenario, the embedded practice

integration of digital appears solid in enhancing effective library services compared to stand-alone feedback mechanisms.

Inferential Statistics

Previously, research issues, research objectives, data types and variables are the initial steps that guided a logical inferential statistical data analysis. To initially establish the appropriate statistical methods (tools), normality tests and reliability test were conducted as prerequisites prior to undertaking the extensive analytic process. Notably, questionnaire tools were previously confirmed using a pilot test (reliability and validity tests) of 32 respondents and 10 experts, respectively. This reliability test used 175 participants for the same purpose of validating and confirming the degree to which the construct measurements are reliable.

Reliability Test

To test internal consistency, a reliability test was performed on 24 items of 175 questionnaires through SPSS software. Originally, the items were developed on a 5-point Likert scale with 1 being "strongly disagree," 2 being "disagree," 3 being "somewhat agree," 4 being "agree," and 5 being "strongly agree." Cronbach's alpha (α) measures were then obtained to indicate the consistency of the responses in the data set. As per Mutebi et al. (2022) and Tamarah and Samantha (2018), the factors whose Cronbach's Alpha was $\alpha \geq 0.70$ were considered as strongly reliable items, factors with values between 0.50 and 0.70 were considered as moderately reliable items, and factors whose value was < 0.50 were considered as weakly reliable items. The reliability test summary of each factor's component is listed in the table below, along with the factor's Cronbach's alpha (α) values and the corresponding conclusion.

Table 8: Reliability test results

Factors	No of Items	No of Strong Reliability Items	No of Moderate Reliability Items	α – values	Conclusion
Digital Literacy Practice	6	4	2	0.901	Reliable
Level of Service Delivery	7	4	3	0.746	Reliable
DLT (Digital Literacy Practice), ELSD (Level of Effective Library Service Delivery),					

The items with high factors were considered and retained in the subsequent analysis stages; they are DLT (Practice in Digital Literacy), ELSD (Effective Library Service Delivery), LOF (Level of Organization Factor), and LTI (Level of Technology Infrastructure). The moderate reliability factors were revised and retained along with the high reliability items, and the weak reliability items were dropped from the above table. The relevant variables were then tested for normality to determine the best variables to use for correlation and regression analysis.

Summary of the Findings

The main findings of this study as guided by the two objectives and research questions of the study as earlier listed above and explained as follows.

level of digital literacy practices

The research measured conformity with Digital Literacy Practice (DLP) in six public organizations using the proportion of respondents who said "agree" and "strongly agree" to statements of DLP. High agreement percentages were used to represent higher conformity with guidelines of DLP, and lower agreement was used to represent practice gaps. Results indicate high presence of DLP in five organizations and a crucial deficit in one organization. With the exception of one institution, the levels

of agreement were uniformly high in the mid 70s, reflecting strongly consistent implementation of DLP. One institution was significantly higher, with the results reflecting near universal support for practices assessed. On the opposite end of the scale, one institution had significantly lower agreement, reflecting rare use of digital literacy activities and systematic barriers to practice. These trends indicate that, in general, public institutions are demonstrating an acceptable rate of compliance to established digital literacy standards, but the variability specifies where attention is needed. The outlier that demonstrates low agreement can be experiencing issues with insufficient training, lack of access to digital tools, ineffective policies, or contextual impediments to practice. The best-performing institution may provide well-performing policy, training, or models of resource allocation that might be replicable elsewhere.

Level of Effective Library Service Delivery

Comparison of agreement levels in the institutions illustrates a general positive trend in adherence to the Level of Effective Library Service Delivery (ELSD). The majority of institutions where one can visibly see lines of respondents in agreement or strong agreement with attributes of effective service delivery, illustrate the presence of basic functions, policies and practices, and that such are recognized by stakeholders. One institution ranks highest with the highest level of agreement, indicating higher consistency in delivering service standards and practices. One institution ranks lowest with the lowest level of agreement, indicating areas that are most likely to be undeveloped or practiced unevenly for ELSD components. The remaining institutions rank in between with moderate to high consensus with ELSD expectations. The trend also reflects an institutional trend: public institutions seem to record greater total compliance with the ELSD standard than some of their counterparts, and that may be attributed to variations in regulatory control, allocation of resources, or routine processes. High agreement over certain attributes is associated with improved perceived provision of services, and low agreement with worse performance or failure to deliver in those areas. Taken overall, the findings suggest that while the baseline for good service delivery is broadly established throughout the sample, there remains diversity. This diversity speaks to the possibility of targeted improvement specifically in institutions where the perceived quality is poorest as well as to implementing best practice from better-performing institutions to enhance standards throughout the system.

Relationship between digital literacy practices and effective service delivery

The findings from the research establish proof of high and statistically significant positive relationship between Effective Library Service Delivery (ELSD) and Digital Library Practice (DLP). Particularly, a rise in the DLP factor of one unit is linked with an increase in the log odds of being at a higher level of ELSD by $\beta = 1.993$ (Joshi et al., 2015; Mutebi et al., 2022), and the association is at conventional levels of statistical significance ($p < 0.05$). Interpreting the coefficient in terms, the impact is large: transforming the log-odds to odds ratio implies the probability of better service delivery increases significantly with better digital practices. That is, subscribing libraries and making more complete use of digital practices like integrated digital catalogs, online access to materials, digital reference services, and digital acquisition and circulation workflows are significantly more likely to have greater levels of service effectiveness than libraries that make less extensive use of digital practice. This finding confirms that digital transformation is not a luxury but an essential driver of service excellence for modern libraries. This finding is in accordance with earlier research that presented evidence to show that investments in digital capacity and employee capability lead to tangible benefits in terms of user access, responsiveness, and relevance of library services. Statistical significance emphasizes that the observed association is not probably due to chance in the sample being studied, and the coefficient size gives evidence of an effect of practical significance. Nevertheless, as enticing as the association appears to be, it must be considered in the constraints of the research design: causal conclusions need to be drawn in light of potential confounders, and the time sequence of digital practice uptake and service development.

Conclusion

This research discussed practice of digital literacy and effectiveness of service delivery at Nigerian public university libraries in line with the extent to which staff and clients use digital competencies and to what extent these practices contribute to service results. Practice of digital literacy occurs in every library included in the survey but is of varying extent and frequency: fundamental operation capability and daily utilization of integrated library systems are prevalent, but more advanced capabilities like digital scholarship support, metadata management, and data curation are less widespread. Technical and resource limitations, sporadic training opportunities, and uneven managerial interest circumscribe more widespread use. Quantitative analysis verifies positive, statistically significant relationships between practice in digital literacy and service delivery performance measurements (accessibility, responsiveness, information quality, and user satisfaction), indicating that digital competence improvements are linked to improved service performance. The relationship is, however, moderated by the quality of ICT infrastructure, institutional policy, and the motivation of employees. The research finds that digital literacy is in fact a critical facilitator of quality library services in Nigerian public universities but efforts to realize its full potential call for strategic investment in capacity development, infrastructure, and policy harmonization. These kinds of interventions that span both human and technology angles are thus critical to long-term service enhancement initiatives. Subsequent studies ought to investigate longitudinal effects of focused training and study cost-effective models for scaling digital literacy in varied institutional contexts national rollout.

Recommendations

Following the findings of the study, the following are some recommendations made to enhance digital literacy practice and thereby improve the efficacy of service delivery in Nigeria's public university libraries. First, implement ongoing professional development programs incorporating basic and advanced digital skills, presented via blended learning, peer mentoring, and certification tracks. Second, prioritize investment in ICT infrastructure, sound networks, up-to-date computers, sufficient bandwidth, and digital resource subscriptions to eliminate technical constraints. Third, develop and institutionalize transparent digital literacy policies and strategic plans that include role assignments, performance indicators, and budgetary support. Fourth, incorporate user-driven digital literacy outreach through library programming, with workshops, online lessons, and integrated instruction in academic coursework to develop student and faculty proficiency. Fifth, promote inter-institutional collaboration and partnership with national agencies, donors, and technology firms to access funding, expertise, and scalable solutions. Sixth, establish monitoring and evaluation mechanisms for tracking progress, evaluating impacts on service delivery, and guiding continuous improvement. Seventh, establish incentive systems for promoting uptake of digital practices among staff, including reward schemes, career progression tied to competencies, and incentives for innovation. Finally, the authors suggest further research consisting of longitudinal and cost-effectiveness analysis to guide policy and maximize interventions. These proposals must be implemented in an integrated manner. This will overcome human and technical hurdles and foster sustainable improvement in the quality of public university library services. It calls on stakeholders to coordinate and execute timely, balanced implementation nationwide now.

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