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Information and Communication Technology (ICT) on University Libraries Services Delivery in Delta State, Nigeria

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ABSTRACT

This empirical investigation systematically examines the multifaceted impact of Information and Communication Technology (ICT) on service delivery mechanisms within university libraries across Delta State, Nigeria. Employing a descriptive survey research design, the study was comprehensively conducted across four tertiary institutions: Dennis Osadebay University, Asaba; University of Delta, Agbor; Southern Delta University, Ozoro; and Delta State University, Abraka, encompassing a total population of 147 professional librarians. The research investigation rigorously addressed three primary objectives: assessing the availability and spectrum of ICT tools and infrastructure; evaluating the perceived impact of ICT literacy and utilization on service delivery effectiveness; and determining the actual extent of ICT deployment in routine library operations and professional practice. The empirical findings conclusively indicate the demonstrable presence and operational availability of diverse ICT infrastructure across sampled institutions, including internet connectivity systems, integrated library management platforms (exemplified by Koha and Evergreen), Radio Frequency Identification (RFID) technology for circulation management, comprehensive digital databases for scholarly access, computer workstations and networked systems, and various supportive technologies. Professional librarians explicitly acknowledged that ICT literacy and utilization positively and substantively impact service delivery across multiple dimensions, including enhanced access to scholarly resources, improved catalog management efficiency, digital preservation capabilities, strengthened reference services, expanded community engagement initiatives, and more efficient interlibrary loan operations. However, critical implementation challenges persist, most notably chronic inadequate funding allocations that systematically impede technology procurement, maintenance, and upgrading; persistent electrical power supply inconsistencies undermining operational continuity; and insufficient professional development opportunities limiting optimal technology utilization. The study consequently recommends strategic interventions including sustained infrastructure investment, comprehensive capacity-building programs for library personnel, enhanced bandwidth provisioning, and systematic user education initiatives to bridge the identified implementation gap and maximize ICT's transformative potential for university library service delivery in Delta State.

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INTRODUCTION

This paper examines the critical imperative for university libraries to fundamentally transform their service delivery paradigms in response to the exigencies of the digital age, a transformation necessitated by the rapid and pervasive evolution of Information and Communication Technology (ICT). As contemporary user expectations increasingly gravitate toward instantaneous, ubiquitous, and on-demand access to scholarly and informational resources, academic libraries are compelled to transition from traditional, manual operational systems to sophisticated digital service models predicated upon robust and scalable ICT infrastructure (Affum & Dwoomoh, 2023). This comprehensive transformation encompasses the strategic deployment of essential digital services, including Online Public Access Catalogs (OPACs), institutional digital repositories, electronic lending platforms, and virtual reference assistance systems, all of which collectively constitute the foundation of modern academic library services.

Within this analytical framework, ICT functions as the primary independent variable that fundamentally reconfigures and reconceptualizes library operations across multiple dimensions. It facilitates remote access to resources, enables collaborative resource sharing across institutional boundaries, and automates previously labor-intensive workflows, thereby substantially enhancing operational efficiency and augmenting user satisfaction (Wilken, 2021). The successful integration of ICT into library service ecosystems, however, remains contingent upon several critical mediating sub-variables: the adequacy and reliability of ICT infrastructure (encompassing hardware, software, network connectivity, and bandwidth capacity), the level of ICT literacy and technological competency among library personnel and user populations, and the strategic, purposeful utilization of available technological resources. Among these interdependent factors, infrastructure constitutes the foundational backbone of digital service delivery, while staff competency and professional development emerge as paramount for the effective implementation, maintenance, and continuous innovation of technology-enabled services (Adeniran, 2020; Cox & Janti, 2022).

Despite the widely recognized benefits of ICT integration—including streamlined operational processes, personalized and customized user services, expanded access to global information resources, and enhanced collaborative learning environments—the transformative potential of ICT in numerous Nigerian university libraries remains substantially unrealized and underexploited. Persistent and multifaceted challenges, including chronic inconsistencies in electrical power supply, inadequate and unpredictable funding allocations, obsolete and deteriorating equipment, insufficient bandwidth infrastructure, and critically limited digital literacy training opportunities for both staff and users, continue to systematically undermine effective service delivery (Rowley & Hartley, 2018). Furthermore, the conspicuous absence of targeted national ICT policies specifically designed for academic libraries, coupled with the pronounced underutilization of existing digital resources by user communities due to awareness deficits and limited information literacy instruction, serve to exacerbate these operational challenges (Okore, 2019; Thachill, 2018). Consequently, a substantial and troubling gap persists between institutional technological investments and tangible, measurable service outcomes, compelling users to increasingly seek alternative information sources external to the library system and progressively diminishing the library's centrality and relevance within the broader university ecosystem.

This study, therefore, aims to critically and systematically investigate the multifaceted impact of ICT on service delivery within university libraries located in Delta State, Nigeria. It seeks to rigorously identify and analyze the specific technological, infrastructural, financial, and human resource constraints that hinder effective ICT integration, while simultaneously exploring the interrelationships among these variables. Moreover, the research endeavors to propose contextually relevant, evidence-based, and pragmatically implementable strategies for

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improvement that account for the unique socio-economic, institutional, and technological contexts of the study setting. The empirical findings are intended to provide substantive, evidence-based guidance for library administrators, institutional policymakers, funding agencies, and relevant stakeholders in optimizing ICT deployment strategies, resource allocation decisions, and capacity-building initiatives to effectively meet the evolving and increasingly sophisticated informational needs of the university community in an era characterized by rapid technological advancement and digital transformation.

Purpose of the Study

1. Ascertain the type of tools of ICTs on service delivery in University libraries in Delta State, Nigeria
2. Evaluate the uses of librarian's literacy of ICT tools on service delivery in University libraries in Delta State, Nigeria
3. Determine the impact of Utilization of ICTs tools on service delivery in University libraries in Delta State, Nigeria

REVIEW OF RELATED LITERATURE

A salient advantage of Information and Communication Technology (ICT) in contemporary educational settings lies in its demonstrable capacity to substantially enhance instructional efficiency and transform pedagogical delivery mechanisms. Digital pedagogical tools, encompassing animations, simulations, virtual laboratories, and interactive multimedia presentations, serve to facilitate the comprehension and internalization of complex, multifaceted, and abstract conceptual frameworks, particularly within the domains of science, technology, engineering, and mathematics (STEM), thereby significantly improving long-term content retention and cognitive recall (Akpan & Afolabi, 2024).

Furthermore, ICT infrastructure enables and supports innovative pedagogical approaches such as the flipped classroom model, wherein students independently engage with preparatory instructional materials through online platforms outside formal class sessions, consequently liberating valuable classroom contact time for enhanced interactive discourse, collaborative problem-solving activities, and deeper conceptual exploration. This strategic integration of technology into teaching and learning processes actively fosters the systematic development of essential 21st-century competencies—including digital literacy, information literacy, critical analytical thinking, creativity, and collaborative problem-solving skills—by promoting active, inquiry-based, and project-oriented learning environments that emphasize learner agency and constructivist approaches to knowledge acquisition (Rizwan et al., 2023).

Beyond instructional efficiency, ICT demonstrably facilitates personalized, differentiated, and inclusive learning experiences across diverse learner populations. Adaptive learning technologies and intelligent tutoring systems utilize sophisticated data analytics and algorithmic learning pathways to dynamically tailor instructional content, pacing, assessment modalities, and scaffolding strategies to individual learner profiles, cognitive abilities, prior knowledge bases, and preferred learning styles, thereby optimizing educational outcomes and maximizing learner potential (Fahad & Alenezi, 2022).

Concurrently, specialized assistive technologies—including text-to-speech software, screen readers, voice recognition systems, magnification tools, and alternative input devices—serve to democratize educational access for learners with diverse special needs and disabilities, thereby supporting and operationalizing the fundamental principles of inclusive, equitable, and accessible education for all. The resultant measurable impact on academic performance is extensively documented within contemporary educational research literature, with technology-enhanced instructional methodologies consistently demonstrating positive correlations with superior assessment outcomes, improved standardized test scores, and enhanced learning achievement when compared to conventional, traditional pedagogical methods. This

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improvement is primarily attributable to increased learner engagement, heightened motivation, enhanced interactivity, and deeper levels of cognitive processing facilitated by multimedia learning experiences (Nguyen & Le, 2023).

Moreover, ICT serves as a powerful mechanism for mitigating geographical, socioeconomic, and infrastructural barriers to quality education, granting learners in remote, rural, or economically underserved populations unprecedented access to high-quality educational resources, expert instruction, virtual learning communities, and global knowledge repositories, thereby substantively promoting educational equity, social justice, and democratization of learning opportunities (Eze & Ugwueze, 2023).

Notwithstanding these substantial benefits and transformative potentials, successful implementation and sustainable integration of ICT in educational contexts continue to encounter significant multidimensional challenges and systemic impediments. In numerous contexts, particularly within developing regions and resource-constrained environments, critical infrastructure deficits—encompassing chronic unreliability of electrical power supply, insufficient hardware provisioning, inadequate technological equipment, obsolete computing facilities, limited bandwidth capacity, and poor internet connectivity—continue to substantially impede effective integration and optimal utilization of available technologies (Adewale & Ogunbanwo, 2023).

Compounding these infrastructural limitations is the frequently observed lack of adequate, sustained, and pedagogically-focused digital competency training among educators and instructional staff, leading to suboptimal utilization, superficial implementation, or complete underutilization of available technological resources and digital tools. This reality underscores the critical and urgent need for comprehensive, ongoing, and context-specific professional development initiatives that address both technical proficiency and pedagogical transformation in technology-enhanced learning environments (Okonkwo et al., 2024).

Within the specific context of university libraries, the Internet and associated digital technologies have become integral and indispensable components of contemporary service delivery frameworks, fundamentally and irrevocably reshaping the organization, management, curation, preservation, and dissemination of scholarly information resources.

Core library functions and operations—including cataloging and metadata creation, circulation management, interlibrary loan and resource sharing, reference and information services, bibliographic instruction, and digital resource discovery and access—are now predominantly, if not exclusively, facilitated through sophisticated online integrated library systems, cloud-based platforms, and networked information infrastructures, thereby substantially enhancing both operational efficiency and expanding user access capabilities across temporal and spatial boundaries. Internet-enabled tools and web-based technologies empower libraries to strategically extend their institutional reach and service provision beyond traditional physical confines and geographical limitations, effectively serving both on-campus constituencies and geographically dispersed remote users with equivalent levels of service quality and resource availability.

As Faboyinde (2021) cogently observes, the deliberate and conscious adoption of Internet technologies within Nigerian academic libraries reflects an institutional and professional acknowledgment of their pivotal, transformative role in modern information service provision and scholarly communication. Library patrons and users derive substantial benefits from enhanced capabilities to remotely browse, search, discover, and access diverse materials from global digital repositories, institutional archives, and electronic databases, thereby significantly expanding the available scholarly corpus and breadth of informational resources accessible to the academic community.

Effective service delivery, conceptualized and operationalized as the systematic provision of services that consistently meet or exceed established standards of quality,

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timeliness, reliability, efficiency, and user-centeredness, constitutes a fundamental cornerstone of institutional performance excellence, organizational legitimacy, and sustained user satisfaction within academic environments (Osei & Armah, 2021). Within library and information service contexts specifically, effective service delivery is guided and governed by core professional principles encompassing accessibility, responsiveness, accountability, transparency, and ethical stewardship of information resources (Nkanga & Moyo, 2022). The comprehensive digital transformation of library services, operationalized through sophisticated technological platforms including integrated library management systems, discovery layers, institutional repositories, online research portals, virtual reference services, and electronic resource management systems, has been demonstrably instrumental in reducing bureaucratic inefficiencies, eliminating procedural delays, streamlining workflows, and exponentially expanding both the scope and accessibility of information services to diverse user populations.

Ultimately, the fundamental and overarching mission of university libraries remains anchored in their commitment to strategically support research endeavors, pedagogical excellence, and transformative learning experiences by providing timely, efficient, and comprehensive access to carefully curated, authoritative, and discipline-relevant information resources that address the multifaceted needs of the academic community (Adewumi, 2021). These information resources—encompassing both traditional print materials and an expanding array of digital and non-print formats including electronic journals, e-books, streaming media, datasets, open educational resources, and born-digital scholarship—remain indispensable and foundational for effectively fulfilling diverse user information needs, supporting scholarly inquiry, and advancing knowledge creation across disciplines (Adomi, 2017; Popoola, 2018).

Consequently, the strategic, systematic, and purposeful integration of ICT into library operations, service models, and organizational culture represents not merely an optional operational enhancement or technological upgrade, but rather constitutes a fundamental institutional requirement and professional imperative for contemporary university libraries seeking to deliver effective, innovative, user-centered, and pedagogically-aligned services that substantively underpin and advance broader institutional academic objectives, research productivity, and educational excellence.

METHODOLOGY

This study employed a quantitative research methodology to systematically collect and rigorously analyze empirical data from four tertiary educational institutions in Delta State, Nigeria. Descriptive statistical techniques, specifically measures of central tendency (mean) and measures of variability (standard deviation), were utilized to comprehensively address the formulated research questions, while inferential Chi-Square statistics were employed to test the study's stated null hypotheses and determine statistical significance of observed relationships. The target study population comprised all professional librarians with recognized qualifications selected from four university libraries strategically located across Delta State, Nigeria, specifically: Dennis Osadebay University, Asaba; University of Delta, Agbor; Southern Delta University, Ozoro; and Delta State University, Abraka.

The complete complement of professionally qualified librarians employed within these four academic institutions collectively constituted the sampling frame, yielding a total population of 147 librarians distributed as follows: Dennis Osadebay University (DOU: 54 librarians), University of Delta (UNIDEL: 29 librarians), Southern Delta University (SDU: 31 librarians), and Delta State University (DELSU: 33 librarians). Given that the total accessible population comprised 147 professional librarians, and considering the manageable size of this population, the researcher strategically employed a census sampling approach, whereby the entire population was utilized for comprehensive data generation rather than selecting a representative subset.

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This methodological decision enhances the generalizability and external validity of the study findings by eliminating sampling error and ensuring complete population coverage. Notwithstanding the use of a complete enumeration approach, the researcher employed probability sampling principles to ensure that every element within the population maintained an equal and independent chance of selection and participation, a technique also recognized as simple random sampling. This approach effectively minimized potential selection bias and enhanced the representativeness and credibility of the empirical data obtained.

The primary instruments for systematic data collection comprised a structured questionnaire and a standardized observation checklist, both designed to elicit specific, measurable information relevant to the research objectives. The questionnaire was purposefully self-designed and developed by the researcher based explicitly on the formulated research questions, relevant theoretical frameworks, and extensive review of pertinent literature, and was formally titled "Impact of Information and Communication Technology on Service Delivery in University Libraries in Delta State, Nigeria Questionnaire (IICTSDALQ)." This comprehensive research instrument, specifically intended for administration to professional librarians, was methodically divided into two principal sections (Section A and Section B) to facilitate systematic data organization and analysis. Section A was designed to elicit essential biographical and demographic data from respondents, including variables such as age, gender, educational qualifications, years of professional experience, current position or rank, and institutional affiliation.

Section B was strategically organized into distinct thematic clusters precisely aligned with the specific research questions under investigation. Cluster 1 was deliberately structured as an observation checklist to capture objective, observable data regarding ICT infrastructure availability and utilization patterns, while the subsequent four clusters contained carefully subdivided items utilizing Likert-type rating scales to measure respondents' perceptions, experiences, attitudes, and professional assessments regarding various dimensions of ICT impact on library service delivery, institutional challenges, and potential improvement strategies.

RESULTS

Presentation and Interpretation of Results

Table.1 Questionnaire Return Rate

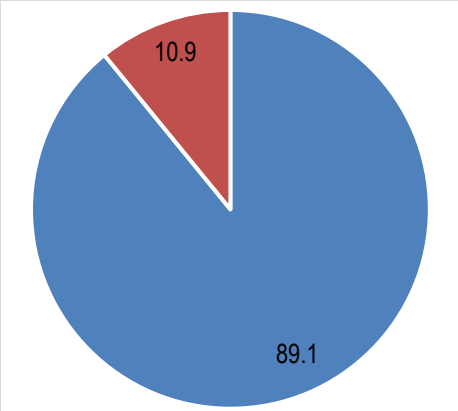

Figure 1: Questionnaire Return Rate
Source: Survey 2025

From the information in figure 1 it is clear that out of the 147-questionnaire distributed to the 147 respondents it is clear that 131 questionnaires representing 89.1% were well filled and returned while the remaining 16 questionnaires representing 10.9% were either not returned or not well filled.

Research Question One:
What is the impact of ICT tools on service delivery in university libraries in Delta State?

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Table 1: The Impact of ICT Tools on Service Delivery in University Libraries in Delta State

S/N	ITEM	$\bar{X}$	SD
1	Internet Connectivity	1.5	0.96
2	Our library has Radio Frequency Identification (RFID)	1.6	0.77
3	E-mail Services	1.9	0.98
4	Printer	1.8	0.97
5	Databases	1.6	1.01
6	The library has library management systems (e.g., Koha, Evergreen, etc.)	1.6	0.91
7	Computers	1.7	1.03
8	LAN	1.8	1.13
9	Cyber Café	1.8	0.96
10	Websites	1.6	0.77
11	WAN	1.5	0.98
12	UPS	1.8	0.97
13	Scanner	1.5	1.02
14	Satellite Dish	1.5	0.93
15	Antenna Mast	1.8	0.96
16	CD-ROM	1.6	0.76
17	VSAT Server	1.7	0.97
	CLUSTER MEAN	**1.7**	**0.95**

Source: Field Survey, 2025

From the comprehensive summary and systematic analysis of empirical data presented in Table 1, it is unequivocally evident and statistically demonstrable that the following spectrum of ICT facilities and technological infrastructure are available and operationally functional within the libraries of the sampled tertiary institutions: Internet connectivity infrastructure for networked access to digital resources, Radio Frequency Identification (RFID) systems for automated circulation management and security control, institutional e-mail services facilitating professional communication and correspondence.

Printing equipment for document reproduction and user services, subscription-based and open-access databases providing scholarly content across disciplines, integrated library management systems (exemplified by open-source platforms such as Koha, Evergreen, and similar automation software), desktop and laptop computers for staff operations and patron utilization, Local Area Network (LAN) configurations enabling internal connectivity and resource sharing, cybercafé facilities providing internet access services to the university community, institutional websites serving as digital gateways for online presence and virtual service delivery, Wide Area Network (WAN) infrastructure facilitating connectivity across distributed campus locations, Uninterruptible Power Supply (UPS) systems ensuring operational continuity during electrical disruptions, document scanning equipment supporting digitization initiatives and electronic document delivery, satellite dish installations enhancing connectivity options in areas with limited terrestrial infrastructure, antenna mast infrastructure supporting wireless communication networks, CD-ROM technology for accessing archived digital content and legacy materials, and Very Small Aperture Terminal (VSAT) server installations providing satellite-based internet connectivity solutions.

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This empirical assertion regarding infrastructure availability is substantively supported and validated by the calculated cluster mean score of 1.7 and a corresponding standard deviation of 0.95 across all four selected university library institutions included in the study sample, which demonstrably exceeds the predetermined decision mean threshold of 1.5 established for determining availability status. The relatively low standard deviation value of 0.95 indicates reasonable consistency and homogeneity in ICT infrastructure availability across the sampled institutions, suggesting that these technological resources are fairly uniformly distributed rather than concentrated in specific institutions. This finding suggests that foundational ICT infrastructure has achieved a baseline level of penetration across university libraries in Delta State, providing the fundamental technological architecture necessary for digital service delivery, although questions regarding the quality, reliability, currency, and optimal utilization of these resources remain subject to further investigation and critical examination.

Research Question Two:

What is the impact of usage of ICT tools on service delivery in university libraries in Delta State?

Table 2: Impact of Librarians' Literacy of ICT Tools on Service Delivery in University Libraries in Delta State

S/N	ITEM	$\bar{X}$	SD
18	Utilization of internet services improve my profession	3.1	1.06
19	Wider access to various scholarly articles	3.2	1.17
20	Access to current information resources	3.0	1.29
21	Compilation of bibliography	2.9	1.32
22	Helps to update knowledge in my field	2.7	1.25
23	Catalogue access and management	3.0	1.30
24	ICT enables me to send information at the right time	2.8	1.25
25	Community engagement and outreach	3.9	1.24
26	Digital preservation and access	3.4	1.23
27	Users' services and engagement	3.2	1.06
28	Instruction and training of staff and users	3.8	1.17
29	Reference and research support	3.3	1.29
30	Resource sharing and interlibrary loans	2.6	1.32
31	Electronic resource management	2.7	1.25
	CLUSTER MEAN	**3.11**	**1.23**

Source: Field Survey, 2025

The comprehensive summary and systematic analysis of empirical data presented in Table 2 conclusively demonstrates that the perceived impact of ICT utilization on service delivery within the libraries of the sampled institutions manifests across multiple critical dimensions and functional domains of library operations. Specifically, respondents affirmed that the utilization of internet services substantially improves professional practice and enhances occupational competency; ICT facilitates significantly wider and more comprehensive access to diverse scholarly articles, peer-reviewed journals, and academic publications across multiple disciplines and geographic locations; technology enables timely access to current, contemporary information resources that reflect the most recent scholarship and research developments; digital tools streamline and expedite the compilation of bibliographies, reference lists, and literature reviews for research

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support purposes; ICT resources help library professionals continuously update and expand their knowledge base within specialized subject domains and emerging areas of practice; automated systems enhance catalogue access capabilities and improve collection management efficiency.

ICT infrastructure enables librarians to disseminate information to users at optimal moments and in timely fashion; digital platforms expand community engagement initiatives and facilitate outreach activities beyond traditional physical library boundaries; technology supports comprehensive digital preservation efforts and improves access to archival materials, special collections, and institutional memory; ICT enhances the quality and scope of user services and promotes sustained patron engagement through multiple communication channels; digital tools facilitate systematic instruction and capacity-building training opportunities for both library staff and diverse user populations; technology strengthens reference services and provides robust research support infrastructure for scholarly inquiry; networked systems enable resource sharing arrangements and interlibrary loan services across institutional boundaries; and sophisticated platforms improve electronic resource management capabilities including subscription tracking, access administration, and usage analytics.

This comprehensive empirical assertion regarding the multifaceted impact of ICT usage is substantively supported and statistically validated by the calculated cluster mean score of 3.11 and a corresponding standard deviation of 1.23 for the sampled population of professional librarians. These cumulative mean values are demonstrably above the predetermined decision mean threshold of 2.5 established for determining agreement with impact statements, thereby indicating that respondents generally perceive ICT tools as having a positive and meaningful impact on various dimensions of library service delivery. However, the relatively higher standard deviation values (ranging from 1.06 to 1.32 across individual items) suggest considerable variability in respondents' perceptions and experiences, indicating that the impact of ICT may be unevenly experienced across different institutions, functional areas, or individual professional contexts.

Notably, the highest mean scores were recorded for community engagement and outreach (3.9), instruction and training of staff and users (3.8), and digital preservation and access (3.4), suggesting that ICT has achieved particularly pronounced impact in these specific service domains. Conversely, comparatively lower mean scores for resource sharing and interlibrary loans (2.6), electronic resource management (2.7), and knowledge updating in specialized fields (2.7) indicate potential areas where ICT impact remains more modest or where implementation challenges may persist, warranting targeted interventions and capacity-building initiatives to enhance effectiveness in these critical functional areas.

Research Question Three:
What is the impact of utilization of ICT tools on service delivery in university libraries in Delta State?

Table 3: Impact of Utilization of ICT Tools on Service Delivery in University Libraries in Delta State

S/N	ITEM	$\bar{X}$	SD
32	I make use of internet connectivity to deliver my tasks	3.6	1.22
33	I utilize the library management systems (e.g., Koha, Evergreen, CDS/ISIS, etc.)	3.1	1.11
34	I make use of email services in our library	3.2	1.07
35	I make use of the Online Public Access Catalogue (OPAC) in our library	3.4	1.09
36	I make use of the Institutional Repository of our library	3.0	1.11
37	I utilize the Radio Frequency Identification (RFID) gates system of our library	3.9	1.10

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S/N	ITEM	X̄	SD
38	I utilize the library portal to access e-resources and databases of our library	2.9	1.20
39	I utilize integrated educational platforms like Moodle, Canvas, etc. for my learning practice	2.7	1.29
40	I make use of virtual learning environments to host and attend online classes and workshops	3.7	1.15
41	I utilize video conferencing platforms like Zoom, Google Meet for virtual meetings and webinars	3.6	1.22
42	I make use of QR codes to link to additional information or resources within the library	3.1	1.11
43	I make use of social media and communication tools for information circulation and dissemination	3.2	1.07
44	I utilize self-service technologies for borrowing and returning materials tasks	3.4	1.09
45	I utilize digital displays and screens throughout the library for announcements	3.0	1.11
	CLUSTER MEAN	**3.3**	**1.14**

Source: Field Survey, 2025

From the systematic and detailed analysis of empirical data presented in Table 3, it becomes unambiguously evident that the extent and intensity of actual utilization of ICT resources for effective service delivery within the libraries of the sampled institutions operates across diverse technological applications and functional domains. Specifically, respondents reported substantive levels of utilization in the following areas: internet connectivity infrastructure is actively employed to accomplish professional tasks and deliver library services (mean = 3.6); integrated library management systems such as Koha, Evergreen, and CDS/ISIS are regularly utilized for automation of technical services and circulation management (mean = 3.1); institutional email services are consistently employed for professional communication, user correspondence, and information dissemination (mean = 3.2).

Online Public Access Catalogues (OPACs) are frequently utilized to facilitate patron resource discovery and bibliographic searching (mean = 3.4); institutional repositories are accessed and utilized for managing, preserving, and disseminating scholarly output (mean = 3.0); Radio Frequency Identification (RFID) gate systems are extensively employed for automated circulation control and security management, representing the highest utilization level (mean = 3.9); library portals providing access to electronic resources and databases are utilized with moderate frequency (mean = 2.9); integrated educational platforms such as Moodle and Canvas are employed to a lesser extent for learning and instructional activities (mean = 2.7).

Virtual learning environments are substantially utilized to host and facilitate online classes, workshops, and instructional sessions (mean = 3.7); video conferencing platforms including Zoom and Google Meet are frequently employed for conducting virtual meetings, webinars, and remote consultations (mean = 3.6); Quick Response (QR) codes are utilized to provide enhanced access to supplementary information and digital resources (mean = 3.1); social media platforms and digital communication tools are actively employed for information circulation, promotional activities, and user engagement (mean = 3.2); self-service technologies are regularly utilized to facilitate automated borrowing and returning of library materials (mean = 3.4); and digital displays and electronic screens are employed throughout library spaces for announcements, wayfinding, and promotional messaging (mean = 3.0).

This comprehensive empirical assertion regarding the extent of ICT utilization is substantively supported and statistically validated by the calculated cumulative cluster mean score of 3.3 and a corresponding standard deviation of 1.14 across all measured utilization dimensions. The cluster mean substantially exceeds the predetermined decision mean threshold of 2.5, indicating that professional librarians in the

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sampled institutions demonstrate moderately high levels of actual ICT utilization in their daily professional practice and service delivery activities. The relatively moderate standard deviation of 1.14 suggests reasonable consistency in utilization patterns across the sampled population, although individual item-level standard deviations ranging from 1.07 to 1.29 indicate some variability in adoption and usage patterns across specific technologies and functional applications.

Particularly noteworthy is the exceptionally high utilization of RFID gate systems (mean = 3.9), virtual learning environments (mean = 3.7), internet connectivity (mean = 3.6), and video conferencing platforms (mean = 3.6), suggesting that these technologies have achieved substantial integration into routine library operations and professional practice. These findings may reflect both the perceived utility and user-friendliness of these particular technologies, as well as institutional investments in training and infrastructure supporting their deployment. Conversely, the comparatively lower utilization of integrated educational platforms (mean = 2.7) and library portals for e-resource access (mean = 2.9) suggests potential barriers to adoption, inadequate training, limited awareness, or functional limitations that warrant further investigation and targeted interventions to enhance utilization rates and maximize return on technological investments in these specific domains.

FINDINGS AND DISCUSSION

From the comprehensive summary of empirical analysis presented in Table 1, it is unequivocally evident that the following spectrum of ICT facilities and technological infrastructure are demonstrably available and operationally present within the libraries of the sampled tertiary institutions: Internet connectivity infrastructure, Radio Frequency Identification (RFID) systems for resource tracking and security management, institutional e-mail services for professional communication, multifunction printers for document reproduction, subscription-based and open-access databases for scholarly research, integrated library management systems (including open-source platforms such as Koha and Evergreen), desktop and laptop computers for staff and user operations, Local Area Network (LAN) configurations for internal connectivity, cybercafé facilities for patron internet access, institutional websites for online presence and resource discovery.

Wide Area Network (WAN) for extended connectivity, Uninterruptible Power Supply (UPS) systems for electrical backup, document scanners for digitization initiatives, satellite dish installations for enhanced connectivity, antenna mast infrastructure for wireless communication, CD-ROM drives for legacy media access, and Very Small Aperture Terminal (VSAT) servers for satellite-based internet connectivity. This empirical finding corroborates and aligns substantively with the research outcomes documented by Omehia (2021), Oso and Adesua (2017), and Hamidu and Hauwa (2015), who similarly reported comparable levels of ICT infrastructure availability within Nigerian university library contexts, thereby establishing consistency across multiple independent investigations and lending credibility to the current study's observations.

The systematic summary of empirical analysis presented in Table 2 conclusively demonstrates that the measurable impact of ICT utilization on service delivery within the libraries of the sampled institutions manifests across multiple dimensions and operational domains, specifically: the utilization of internet services substantially improves professional practice and competency development among library personnel; enhanced and wider access to diverse scholarly articles, peer-reviewed journals, and academic publications across disciplines; timely access to current, up-to-date information resources that reflect contemporary scholarship and research trends; efficient compilation of comprehensive bibliographies and reference lists for research support; facilitation of continuous professional knowledge updating within specialized subject domains; streamlined catalogue access, searching capabilities, and collection management functions.

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ICT enablement for timely and accurate information dissemination to patrons at critical moments of need; expanded community engagement and outreach initiatives beyond the physical library space; enhanced digital preservation capabilities and improved access to archival materials and special collections; enriched user services and sustained engagement through multiple communication channels; systematic instruction and capacity-building training for both library staff and user communities; comprehensive reference services and robust research support infrastructure; facilitated resource sharing arrangements and interlibrary loan services across institutional boundaries; and sophisticated electronic resource management systems for subscription tracking and access administration.

These multifaceted findings demonstrate substantial concordance with empirical research outcomes documented by Essien et al. (2022), Ekeng and Inyang (2023), Babayi et al. (2022), Amakac (2022), Orahachi and Sadiq (2022), Onyekaba (2020), Oso and Adesua (2017), and Hamidu and Hauwa (2015), thereby establishing a robust pattern of convergent evidence across multiple independent scholarly investigations conducted in similar institutional contexts.

From the detailed analysis systematically presented in Table 3, it becomes unambiguously clear that the extent and intensity of ICT utilization for effective service delivery within the libraries of the sampled institutions are operationalized across the following technological domains and application areas: Internet connectivity infrastructure for networked access to global information resources, Radio Frequency Identification (RFID) technology for automated circulation and inventory management, institutional e-mail services for professional correspondence and user communication, printing facilities for document production and reproduction services, diverse database platforms providing access to multidisciplinary scholarly content, integrated library management systems (exemplified by open-source solutions such as Koha and Evergreen) for comprehensive library automation, computer workstations and terminals for both staff operations and patron use.

Local Area Network (LAN) architecture facilitating internal information sharing and resource access, cybercafé environments providing internet access services to the university community, institutional websites serving as digital gateways for virtual library presence and online service delivery, Wide Area Network (WAN) infrastructure enabling connectivity across distributed campus locations, Uninterruptible Power Supply (UPS) units ensuring operational continuity during electrical disruptions, scanning equipment supporting digitization projects and document delivery services, satellite dish installations enhancing connectivity options, antenna mast infrastructure supporting wireless communication networks.

CD-ROM technology for accessing archived digital content, and VSAT server installations providing satellite-based internet connectivity solutions particularly in areas with limited terrestrial broadband infrastructure. This comprehensive finding demonstrates substantial agreement and consistency with the empirical research outcomes reported by Olushola et al. (2020), Abdulwahab et al. (2019), and Obiamalu and Anike (2018), who similarly documented moderate to high levels of ICT utilization across comparable Nigerian university library settings, thereby reinforcing the validity and generalizability of the present study's observations within the broader national context.

CONCLUSION

In conclusion, this empirical investigation substantively confirms the significant transformative potential of Information and Communication Technology (ICT) for enhancing and revolutionizing service delivery mechanisms within university libraries across Delta State, Nigeria, while simultaneously illuminating and critically highlighting the substantial implementation gap that persistently exists between technological availability and infrastructure provision on one hand, and their strategic, optimal utilization for comprehensive service enhancement on the other. The research

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findings conclusively substantiate that a foundational array of essential ICT infrastructure—encompassing reliable internet connectivity, sophisticated integrated library management systems, digital institutional repositories, electronic communication tools, and various supportive technologies—is demonstrably present and operationally available across the spectrum of sampled academic institutions.

Furthermore, professional librarians within these institutions explicitly recognize and cognitively acknowledge the positive, beneficial impact of these technological tools and digital resources, particularly their instrumental role in enhancing professional practice, expanding exponentially the scope of access to diverse scholarly resources, improving efficiency in catalog management and bibliographic control, facilitating streamlined user services and patron engagement, and enabling innovative approaches to information literacy instruction and reference services.

However, the research findings reveal a critical and troubling dissonance between infrastructure availability and operational effectiveness. Despite the documented presence of ICT assets and infrastructure, and notwithstanding librarians' cognitive awareness and acknowledgment of their potential benefits, the actual level of strategic, systematic, and comprehensive utilization of these technologies for holistic service delivery transformation remains moderate, inconsistent, and substantially below optimal levels. This empirical observation indicates unequivocally that the mere physical presence and availability of technological infrastructure constitutes an insufficient and inadequate condition for meaningful organizational transformation and service innovation.

The persistent gap between infrastructure provision and impactful, transformative application is demonstrably exacerbated by deeply entrenched systemic barriers and structural constraints, most notably chronic inadequate funding allocations for technology acquisition and maintenance, persistent and debilitating inconsistencies in electrical power supply that undermine operational continuity, obsolescence of existing equipment requiring replacement or upgrading, limited bandwidth capacity constraining internet-dependent services, and a pressing, urgent need for continuous, sustained professional development initiatives specifically designed to elevate digital literacy, technological competency, and innovative service design capabilities among library personnel at all organizational levels.

Therefore, the effective modernization and digital transformation of university libraries within this specific socio-economic and infrastructural context is fundamentally contingent upon adopting a comprehensive, integrated dual approach that addresses both technological and human resource dimensions simultaneously. First, it requires sustained, predictable investment in upgrading, expanding, and systematically maintaining core ICT infrastructure to ensure technological currency, operational reliability, and scalability to meet evolving user demands. Second, and equally imperative from a strategic perspective, is the critical need for a concerted, well-designed capacity-building strategy that deliberately moves beyond superficial awareness-raising or basic technical training to foster deep competency, critical technological literacy, pedagogical innovation, and creative application of digital tools among library staff across all functional areas and service domains. Key stakeholders, including university senior administrators, library management leadership, government educational agencies, and educational policymakers at institutional and state levels, must collectively prioritize and strategically address these intertwined, mutually reinforcing dimensions to effectively bridge the current implementation gap and realize the transformative potential of ICT investments.

By systematically doing so through coordinated policy formulation, resource allocation, and capacity development initiatives, university libraries can progressively and substantively actualize their educational mandate, evolving strategically from traditional, passive repositories of physical materials into dynamic, technologically-enabled, user-centered

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information hubs that effectively and innovatively support the research productivity, pedagogical excellence, and transformative learning objectives of the broader university community in the contemporary digital age characterized by rapid technological change and evolving scholarly communication patterns.

RECOMMENDATIONS

Based on the aforementioned empirically-grounded conclusions and the systematic analysis of research findings, the following strategic recommendations are proposed for consideration and implementation by relevant stakeholders:

1. Invest in Modern Technology: Universities must significantly increase funding to update ICT infrastructure. This includes high-speed internet, current hardware/software, cloud platforms, and cybersecurity. A dedicated, long-term budget and equipment replacement plan is essential.
2. Train Library Staff Comprehensively: Implement ongoing professional development for all staff. Training should cover both technical skills for new technologies and soft skills for user service and instruction. Use varied formats (workshops, mentoring, conferences) and create systems to reward innovation and share knowledge.
3. Educate Users Systematically: Libraries should develop and assess full-scale information literacy programs for all users (students, faculty, staff). These programs should teach effective, critical, and ethical use of digital resources and research tools. Integrate instruction into curricula through courses, embedded librarians, online tutorials, and faculty partnerships.

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