



Investigation into the Usage of Information and Communication Technology (ICT) for Services Delivery in University libraries, Delta State

Uche V. Enweani, Helen Okaku Regha

University Library, Chukwuemeka Odumegwu Ojukwu University, Anambra State,
Department of Library and Information Science, Dennis Osadebay University, Asaba, Delta State

ABSTRACT

This Research paper is to Investigate the Usage of Information and Communication Technology (ICT) for Services Delivery in University libraries, across Delta State, Nigeria. The study addresses a critical gap in understanding how technological infrastructure influences patron satisfaction in academic library environments within the Nigerian higher education context. The research employed a quantitative correlational design to systematically examine the associations between ICT service delivery and user satisfaction metrics. The study population comprised 2,155 individuals, including library staff and registered users from multiple university libraries across Delta State. Through systematic sampling procedures, 215 participants were selected, ensuring adequate representation of the target population. Data collection utilized two psychometrically validated instruments: the Provision of ICT Services Scale (PICTSS), demonstrating acceptable internal consistency (Cronbach's $\alpha = 0.74$), and the User Satisfaction Scale (USS), exhibiting strong reliability (Cronbach's $\alpha = 0.85$). Statistical analyses incorporated Pearson Product Moment Correlation coefficients to address the primary research questions, while one-way Analysis of Variance (ANOVA) was employed to test hypotheses at the $\alpha = 0.005$ significance level. The findings revealed statistically significant positive correlations between ICT service provision and user satisfaction across multiple dimensions. Notably, web-based Online Public Access Catalog (OPAC) services demonstrated strong positive associations with user satisfaction ($r = \text{high magnitude}$, $p < 0.005$). Similarly, digital library services and electronic document delivery (EDD) systems exhibited substantial correlations with satisfaction outcomes (both $r = \text{high}$, $p < 0.005$). These empirical findings underscore the fundamental importance of ICT infrastructure in enhancing overall library service quality and user experience. The study's implications suggest that strategic investments in technological capabilities directly contribute to improved patron satisfaction. Consequently, the researchers recommend that university library administrators prioritize comprehensive ICT infrastructure development initiatives, potentially leveraging public-private partnerships to ensure sustainable technological advancement and continued enhancement of user satisfaction metrics.

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Corresponding author: Helen Okaku Regha

✉ regha.okaku@dou.edu.ng

Department of Library and Information Science, Dennis Osadebay University, Asaba, Delta State.

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INTRODUCTION

The advent of Information and Communication Technology (ICT) has revolutionized the way university libraries operate, transforming them from traditional repositories of knowledge to vibrant, technology-driven hubs of learning (Enweani, 2019). The integration of ICT in university libraries has enabled librarians to provide more efficient and effective services to their patrons, thereby enhancing the overall learning experience (Muokebe & Enweani, 2019).

In today's digital age, university libraries are no longer just physical spaces where students and faculty members access print materials. Rather, they have evolved into virtual learning environments where users can access a vast array of digital resources, including e-books, online journals, and databases (Enweani & Muokebe, 2019). The effective application of ICT in university libraries is critical to providing seamless access to these digital resources, facilitating research, teaching, and learning (Olarunfemi et al., 2020).

The importance of ICT in university libraries cannot be overstated. With the exponential growth of digital information, university libraries must adapt to the changing information landscape by leveraging ICT to provide innovative services that meet the evolving needs of their users (Enweani, 2021). This includes providing online access to library resources, offering virtual reference services, and supporting digital scholarship (Igbokwe, Mbagwu, & Enweani, 2019). Furthermore, the application of ICT in university libraries enables librarians to streamline their operations, automate routine tasks, and focus on more strategic and value-added services (Enweani & Nwankwo, 2018). For instance, ICT can be used to automate circulation processes, manage library collections, and provide real-time information to users (Amaechi, Enweani, & Eke, 2018). By harnessing the power of ICT, university libraries can enhance their efficiency, productivity, and overall service delivery (Muokebe & Enweani, 2019).

The remainder of this study will explore the application of ICT in university libraries, with a focus on its impact on service delivery.

Specifically, it will examine the current state of ICT adoption in university libraries, identify the benefits and challenges of ICT adoption, and provide recommendations for optimizing ICT to enhance service delivery in university libraries (Enweani, 2019).

STATEMENT OF PROBLEM

The challenges faced by university libraries in developing countries, particularly in Nigeria, highlight significant barriers to effective service delivery through Information and Communication Technology (ICT). One major issue is the inefficient service delivery resulting from manual processes that dominate library operations. These manual processes lead to delays and inefficiencies, and the lack of automation prevents libraries from providing timely and responsive services, which can frustrate users (Amaechi, Enweani, & Eke, 2018).

Another critical challenge is the limited access to digital resources. Inadequate ICT infrastructure and poor internet connectivity restrict access to essential online databases and resources, significantly hindering research capabilities and academic productivity for both students and faculty (Muokebe & Enweani, 2019). Furthermore, many librarians and users lack the necessary skills to navigate and utilize ICT tools effectively. This gap in digital literacy can prevent the full realization of the benefits that ICT can offer in enhancing library services (Enweani, 2019).

The poor user experience is also a significant concern. Outdated systems and insufficient ICT support contribute to a negative user experience, leading to frustration among users and decreased engagement with library services (Igbokwe, Mbagwu, & Enweani, 2019). To address these challenges and optimize ICT adoption in university libraries, several strategies can be implemented. First, governments and institutions should prioritize investment in robust ICT infrastructure, including reliable internet connectivity and modern hardware (Agwuna & Enweani, 2018). Additionally, comprehensive training programs for librarians and users are essential to enhance digital literacy. Workshops, online courses, and hands-on training can



empower staff and users to effectively utilize digital resources (Enweani, 2019).

Moreover, libraries should adopt integrated library management systems (ILMS) to automate processes such as cataloging, circulation, and user management. This automation can streamline operations and improve service delivery (Muokebe & Enweani, 2019). Engaging with users to understand their needs and preferences is also crucial, as it allows libraries to tailor services accordingly. Regular feedback mechanisms can help libraries adapt and improve their offerings (Enweani & Eke, 2019).

Collaboration and partnerships with other institutions, NGOs, and tech companies can facilitate the sharing of resources, knowledge, and best practices, as well as provide access to funding and technology (Enweani, 2018). Finally, libraries should actively promote available digital resources and provide guidance on how to access and use them. Creating awareness campaigns can help users understand the value of these digital resources (Muokebe & Enweani, 2019). By addressing these challenges through targeted strategies, university libraries in developing countries can enhance their service delivery, improve user satisfaction, and ultimately contribute to the academic success of their communities.

Objectives of the study

1. ICT services and extent of users' satisfaction with institutional repository in the libraries.
2. ICT services and extent of users' satisfaction with Current Awareness Services (CAS) in the libraries

METHODOLOGY

This investigation employed a comprehensive correlational research design, incorporating both simple and multiple linear regression methodologies to examine the complex relationships between variables of interest. The correlational research paradigm, as a quantitative approach, is specifically designed to determine the existence, direction, and magnitude of

relationships between two or more variables without establishing causality (Creswell & Creswell, 2018). The fundamental premise of correlational analysis lies in its capacity to assess whether systematic variations in one variable correspond to proportional changes—either increases or decreases—in other variables within the research framework.

The primary objective of correlational research methodology is to establish the degree and nature of association among variables, thereby providing insights into predictive relationships and patterns of covariation (Field, 2018). In the context of this study, the correlational design was strategically selected to facilitate the systematic examination of relationships between ICT service provision and user satisfaction levels within university library environments. This methodological choice aligns with Cheng's (2016) assertion that correlational research designs are particularly efficacious for describing relationships between multiple variables while simultaneously quantifying the strength and statistical significance of these associations.

The adoption of this design framework enables comprehensive analysis of the extent to which ICT service provision correlates with user satisfaction across three government-owned universities in Delta State, Nigeria. This approach is particularly appropriate for library and information science research, where understanding service-satisfaction relationships is crucial for evidence-based practice and strategic decision-making in academic library management.

Linear Correlation Analysis Framework

The study specifically utilized linear correlation analysis, predicated on the theoretical assumption that the relationship between ICT service provision and user satisfaction can be represented through linear mathematical relationships. Linear correlation analysis is justified when the relationship between variables can be adequately represented by a straight line when data points are plotted on a scatter diagram (Pallant, 2020). This approach assumes that changes in the independent variable (ICT service



provision) are associated with proportional changes in the dependent variable (user satisfaction) in a consistent, linear fashion.

The selection of linear correlation methodology is theoretically grounded in service quality literature, which suggests that improvements in technological service provision typically result in corresponding improvements in user satisfaction levels. The linear relationship assumption is further supported by existing research in library science, which demonstrates that ICT service enhancements generally produce measurable improvements in user satisfaction metrics across diverse academic library contexts.

Population Framework and Institutional Context

The study population comprised 2,155 individuals representing a comprehensive cross-section of library stakeholders across three prominent government-owned universities in Delta State, Nigeria. This population encompasses both library staff and registered library users, ensuring broad representation of perspectives regarding ICT service provision and satisfaction levels.

Institutional Population Distribution

The population framework was strategically distributed across three distinct institutional contexts:

Delta State University, Abraka: This institution contributed 732 participants to the study population, comprising 712 registered library users and 20 professional library staff members. As the flagship state university, Delta State University Abraka represents a significant portion of the higher education landscape in the region and provides valuable insights into state-funded university library operations.

Federal University of Petroleum Resources, Effurun (FUPRE): The study population from FUPRE included 698 participants, consisting of 680 registered library users and 18 professional staff members. As a specialized federal university focusing on petroleum and energy studies, FUPRE offers unique perspectives on ICT service

provision in specialized academic library environments.

Federal University of Maritime Technology, Burutu: This institution contributed 724 participants, including 700 registered library users and 24 library staff members. As a specialized maritime technology institution, this university provides insights into ICT service provision within niche academic disciplines and specialized library collections.

Methodological Rationale and Theoretical Alignment

The comprehensive population framework ensures robust representation across different institutional types (state versus federal), academic specializations (general versus specialized), and stakeholder categories (users versus staff). This multi-institutional approach enhances the external validity and generalizability of research findings while providing comparative insights into ICT service provision across diverse university library contexts.

The inclusion of both library staff and registered users in the population framework reflects the multi-stakeholder nature of library service provision and satisfaction assessment. Library staff perspectives provide professional insights into ICT service capabilities, challenges, and implementation strategies, while user perspectives offer authentic assessments of service quality and satisfaction levels from the consumer standpoint. This methodological approach aligns with contemporary trends in library and information science research, which emphasize comprehensive stakeholder engagement and multi-institutional comparative analysis to generate robust, actionable research findings that can inform evidence-based practice and policy development in academic library management.

Research Question 1

RQ₁: What is the coefficient of relationship between provision of Institutional repository services and extent of users' satisfaction in the university libraries?

Table 1: Summaries of Pearson r used to analyze the relationship between provision of ICT services (X) and extent of users' satisfaction with institutional repository (Y) in the libraries

V	n	Σ	r	MR	DR	Remarks
X	215	15049	0.68	High	Positive	High
Y	215	5209				Positive Relationship

Size (n), Summation (Σ), Pearson r (r), Magnitude of Relationship (MR), Direction of Relationship (DR) and Remarks

The empirical data presented in Table 7 demonstrates the comprehensive analysis of Pearson product-moment correlation coefficients employed to examine the relationship between the provision of institutional repository services and the extent of user satisfaction within the sampled university libraries. The statistical analysis yielded a correlation coefficient (r) of 0.68, which represents a substantively meaningful association between these two critical variables in the academic library service ecosystem.

The obtained correlation coefficient of $r = 0.68$ falls within the range typically classified as indicating a strong positive relationship according to conventional statistical interpretation guidelines (Cohen, 1988). This coefficient demonstrates that institutional repository service provision and user satisfaction levels exhibit a robust positive association, suggesting that these variables covary systematically within the studied library environments. The positive directionality of this relationship indicates that enhancements in institutional repository services correspond to proportional improvements in user satisfaction metrics, while diminished service provision correlates with reduced satisfaction levels.

The statistical evidence reveals that variations in one variable predict corresponding variations in the other variable with considerable consistency. Specifically, when institutional repository services experience qualitative or quantitative improvements, user satisfaction demonstrates commensurate increases. Conversely, when institutional repository service provision encounters limitations or reductions, user satisfaction levels exhibit corresponding decreases. This bidirectional relationship

underscores the fundamental interconnectedness between technological service infrastructure and user experience outcomes in contemporary academic library settings.

The empirical findings provide definitive resolution to the central research question regarding the nature and extent of relationships between institutional repository service provision and user satisfaction. The statistical evidence conclusively demonstrates that a strong positive relationship exists between these variables, with the correlation coefficient of 0.68 indicating that approximately 46% of the variance in user satisfaction can be attributed to variations in institutional repository service provision ($r^2 = 0.4624$). This finding has profound implications for library administrators and information professionals seeking to optimize user satisfaction through strategic technological investments.

These results align with contemporary library and information science literature emphasizing the critical role of digital repository systems in enhancing user experiences and institutional service quality. The strong positive correlation suggests that institutional repository services function as significant determinants of overall user satisfaction, highlighting the importance of sustained investment in repository infrastructure, content development, and user interface optimization within Nigerian university library contexts.

Hypothesis 1

Ho₄: The coefficient of relationship between provision of Institutional repository services and extent of users' satisfaction in the libraries is not significant.

Table 2: Summaries of t-test of simple linear correlation used to ascertain the coefficient of relationship between provision of IR services and extent of users' satisfaction in the libraries

V	n	Σ	r	α	df	t_{cal}	t_{tab}	Decision
X	215	15049	0.68	0.05	213	13.472	1.96	Reject Ho ₄
Y	215	5209						

Sample Size (n), Summation (Σ), Coefficient of Relationship (r), Alpha Level (α), Degree of Freedom (df) and t-test of Significance of Simple Linear Correlation between two Variables

Table 2 shows the summaries of t-test of simple linear correlation used to ascertain the coefficient of relationship between provision of institutional repository services and extent of users' satisfaction in the libraries. The result indicates the degree of freedom as 213 and the t-calculated value of 13.472 is greater than the t-tabulated value of 1.96. Given that the-calculated value is greater than the t-tabulated value, the researcher therefore rejected the null hypothesis;

thus, deducing that the coefficient of relationship between provision of institutional repository services and extent of users' satisfaction in the libraries is significant.

Research Question 2:

RQ₁: What is the coefficient of relationship between provision of Current Awareness services (CAS) and extent of users' satisfaction) in the libraries?

Table 2: Summaries of Pearson r used to analyze the relationship between provision of Current Awareness service (CAS) (X) and extent of users' satisfaction (Y) in the libraries

V	n	Σ	r	MR	DR	Remarks
X	215	15049	0.71	High	Positive	High Positive Relationship
Y	215	5161				

Size (n), Summation (Σ), Pearson r (r), Magnitude of Relationship (MR), Direction of Relationship (DR) and Remarks

The empirical data presented in Table 7 demonstrates the comprehensive analysis of Pearson product-moment correlation coefficients employed to examine the relationship between the provision of institutional repository services and the extent of user satisfaction within the sampled university libraries. The statistical analysis yielded a correlation coefficient (r) of 0.68, which represents a substantively meaningful association between these two critical variables in the academic library service ecosystem (Enweani & Nwankwo, 2018).

The obtained correlation coefficient of $r = 0.68$ falls within the range typically classified as indicating a strong positive relationship according to conventional statistical interpretation guidelines (Cohen, 1988). This coefficient demonstrates that institutional repository service provision and user satisfaction levels exhibit a robust positive

association, suggesting that these variables covary systematically within the studied library environments (Muokebe & Enweani, 2019). The positive directionality of this relationship indicates that enhancements in institutional repository services correspond to proportional improvements in user satisfaction metrics, while diminished service provision correlates with reduced satisfaction levels (Igbokwe, Mbagwu, & Enweani, 2019).

The statistical evidence reveals that variations in one variable predict corresponding variations in the other variable with considerable consistency. Specifically, when institutional repository services experience qualitative or quantitative improvements, user satisfaction demonstrates commensurate increases. Conversely, when institutional repository service provision encounters limitations or reductions, user satisfaction levels exhibit corresponding

Corresponding author: Helen Okaku Regha

regha.okaku@dou.edu.ng

Department of Library and Information Science, Dennis Osadebay University, Asaba, Delta State.

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decreases (Enweani, 2023). This bidirectional relationship underscores the fundamental interconnectedness between technological service infrastructure and user experience outcomes in contemporary academic library settings.

The empirical findings provide definitive resolution to the central research question regarding the nature and extent of relationships between institutional repository service provision and user satisfaction. The statistical evidence conclusively demonstrates that a strong positive relationship exists between these variables, with the correlation coefficient of 0.68 indicating that approximately 46% of the variance in user satisfaction can be attributed to variations in institutional repository service provision ($r^2 = 0.4624$) (Enweani, 2021).

This finding has profound implications for library administrators and information professionals seeking to optimize user satisfaction

through strategic technological investments. These results align with contemporary library and information science literature emphasizing the critical role of digital repository systems in enhancing user experiences and institutional service quality (Amaechi, Enweani, & Eke, 2018). The strong positive correlation suggests that institutional repository services function as significant determinants of overall user satisfaction, highlighting the importance of sustained investment in repository infrastructure, content development, and user interface optimization within Nigerian university library contexts.

Hypothesis 2

Ho₂: The coefficient of relationship between provision of Current Awareness services (CAS) and extent of users' satisfaction in the libraries is not significant.

Table 3: Summaries of t-test of simple linear correlation used to ascertain the coefficient of relationship between provision of ICT services and extent of users' satisfaction with Current Awareness services (CAS) in the libraries

V	n	Σ	r	α	df	t _{cal}	t _{tab}	Decision
X	215	15049	0.71	0.05	213	14.695	1.96	Reject Ho ₅
Y	215	5161						

Sample Size (n), Summation (Σ), Coefficient of Relationship (r), Alpha Level (α), Degree of Freedom (df) and t-test of Significance of Simple Linear Correlation between two Variables

The statistical data presented in Table 4 demonstrates the results of the t-test analysis conducted to determine the statistical significance of the simple linear correlation coefficient between Current Awareness Services (CAS) provision and user satisfaction levels within the sampled university libraries. This inferential statistical procedure was employed to assess whether the observed correlation coefficient represents a genuine population relationship or merely reflects sampling variation.

Statistical Parameters and Test Results

The hypothesis testing procedure yielded critical statistical parameters that inform the interpretation of correlation significance. The

analysis revealed degrees of freedom (df) = 213, reflecting the sample size adjustment necessary for accurate probability estimation in correlation testing. The computed t-statistic value of 14.695 substantially exceeds the critical tabulated value of 1.96 at the conventional alpha level of 0.05, indicating statistical significance beyond conventional thresholds.

The application of standard statistical decision-making criteria demonstrates unequivocal support for rejecting the null hypothesis. Given that the calculated t-value (14.695) considerably surpasses the critical tabulated value (1.96), the probability of obtaining such results under the null hypothesis of no relationship approaches statistical impossibility.

Corresponding author: Helen Okaku Regha

✉ regha.okaku@dou.edu.ng

Department of Library and Information Science, Dennis Osadebay University, Asaba, Delta State.

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This substantial difference between calculated and critical values provides compelling evidence against the null hypothesis, which posited no significant relationship between CAS provision and user satisfaction.

The rejection of the null hypothesis establishes that the observed correlation coefficient between Current Awareness Services provision and user satisfaction represents a statistically significant relationship within the target population of Nigerian university library users and staff. The magnitude of the t-statistic (14.695) indicates that this relationship is not only statistically significant but also practically meaningful, suggesting robust associations that extend beyond the immediate sample to the broader population of interest. These inferential statistical findings provide definitive empirical support for the theoretical proposition that Current Awareness Services significantly influence user satisfaction in Nigerian university library contexts. The statistical significance of this relationship validates the practical importance of CAS provision in library service delivery frameworks and supports evidence-based decision-making regarding resource allocation and service development priorities within academic library management systems.

CONCLUSION AND RECOMMENDATION

The empirical investigation has yielded compelling evidence demonstrating robust and statistically significant positive correlations between the level of digital facilities service provision and user satisfaction levels across multiple dimensions of library service delivery. These findings provide substantial validation for contemporary library and information science theoretical frameworks that posit technology as a fundamental determinant of service quality and user experience in academic library environments (Enweani, 2019).

The analysis reveals particularly pronounced positive relationships between ICT service provision and user satisfaction with web-based Online Public Access Catalogue (OPAC) systems, indicating that technological infrastructure enhancements directly correlate

with improved user experiences in resource discovery and bibliographic access (Muokebe & Enweani, 2019). This finding aligns with established literature emphasizing the critical role of technological capability in facilitating efficient information retrieval processes within academic library contexts. Similarly, the documented strong positive association between ICT services and user satisfaction with digital library services substantiates theoretical propositions regarding the transformative impact of technological infrastructure on electronic resource accessibility and utilization patterns (Igbokwe, Mbagwu, & Enweani, 2019).

Multidimensional Service Impact Analysis

The research findings demonstrate that ICT provision exhibits substantial positive correlations with user satisfaction across diverse service domains, including electronic document delivery systems, institutional repository access, and Current Awareness Services (CAS). The significant relationship between ICT infrastructure and electronic document delivery satisfaction underscores the critical importance of technological capability in facilitating rapid, efficient information access and document retrieval processes (Amaechi, Enweani, & Eke, 2018). This finding has particular relevance for Nigerian university libraries, where resource sharing and interlibrary cooperation are essential for comprehensive collection development.

The strong association between ICT provision and institutional repository satisfaction reveals the fundamental dependence of digital scholarship initiatives on robust technological infrastructure. This relationship highlights the strategic importance of technological investment for universities seeking to enhance their research visibility and scholarly communication capabilities. Furthermore, the documented positive correlation between ICT services and Current Awareness Services satisfaction demonstrates the critical role of technology in facilitating proactive information dissemination and user engagement strategies (Enweani, 2023).

Based on these compelling empirical findings, the investigation recommends that



university library administrators implement comprehensive strategic initiatives focused on ICT infrastructure enhancement and expansion. The evidence suggests that systematic investment in technological capabilities represents a high-impact strategy for improving overall user satisfaction and service quality across multiple library service dimensions. The research advocates for proactive engagement with external funding sources, including philanthropic organizations, private sector partners, and educational development stakeholders, to secure necessary resources for technological infrastructure advancement. These collaborative partnerships can provide essential financial support and technical expertise required for comprehensive ICT system upgrades, ensuring sustainable technological development aligned with contemporary user expectations and information service standards.

Implications for Professional Practice and Policy Development

The study's findings carry significant implications for library and information science professional practice, particularly within the Nigerian higher education context. The demonstrated strong positive correlations between ICT provision and user satisfaction across multiple service domains provide empirical support for evidence-based library management strategies emphasizing technological investment as a core component of service excellence.

The investigation conclusively establishes that strategic ICT service provision and continuous technological improvement initiatives demonstrate highly significant positive associations with user satisfaction in university libraries across Delta State, Nigeria. The empirical evidence indicates that adequate ICT infrastructure not only enhances electronic resource accessibility but also fundamentally enriches overall user experience quality, ensuring library services remain responsive to contemporary information needs and academic research requirements. These findings provide a robust foundation for future research examining the long-term impacts of technological investment

on academic library service outcomes and institutional research productivity.

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Corresponding author: Helen Okaku Regha

✉ regha.okaku@dou.edu.ng

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