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Assessment of ICT Infrastructure and Its Influence on Library Service Delivery in Selected Polytechnics in Northern Nigeria

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ABSTRACT
Information and Communication Technology (ICT) has become an important component of contemporary academic library operations, particularly in institutions where users increasingly expect rapid access to electronic information resources and technology-enabled services. This study assesses ICT infrastructure and its influence on library service delivery in selected polytechnics in Northern Nigeria. The study adopts a quantitative research approach using a correlational survey design. The target population comprises professional and para-professional library personnel in selected polytechnic libraries in Northern Nigeria. A structured questionnaire, titled ICT Infrastructure and Library Service Delivery Questionnaire (IILSDQ), is proposed for data collection. ICT infrastructure is operationalized through computer facilities, internet and network connectivity, electronic library systems, digital resources, power supply, and technical support, while library service delivery is measured through circulation, reference, current-awareness, electronic information, user education, catalogue, and research-support services. Multiple regression analysis is proposed for testing the hypotheses. The findings suggest that ICT infrastructure will have a positive and statistically significant influence on library service delivery, with internet connectivity and electronic library systems emerge as particularly important predictors. The study is expected to contribute to the understanding of technology requirements for effective library services in Northern Nigerian polytechnics and provide evidence for investment in ICT facilities, reliable electricity, staff training, and technical support.
Keywords: ICT infrastructure, library service delivery, academic libraries, polytechnics, Northern Nigeria, digital resources, internet connectivity.

1. INTRODUCTION

1.1 Background to the Study

The rapid development of Information and Communication Technology (ICT) has changed the way academic libraries acquire, organize, preserve and disseminate information. Traditionally, academic libraries depended heavily on printed books, journals, card catalogues and face-to-face reference services. Contemporary libraries, however, increasingly rely on computers, library management systems, internet connectivity, electronic databases, institutional repositories, digital catalogues, wireless networks and

other technologies to provide information services. ICT has therefore moved from being an auxiliary resource to becoming an important component of modern library operations.

The transformation is particularly relevant to polytechnic libraries because polytechnics support teaching, learning, practical training and applied research across engineering, technology, management, science and related disciplines. Students and staff require timely access to textbooks, journals, standards, technical reports, databases and online information resources. The ability of a library to meet these needs increasingly depends on the availability and reliability of its ICT infrastructure.

ICT infrastructure in an academic library encompasses the physical and technological facilities that support the creation, storage, retrieval, processing and dissemination of information. These include computers, servers, printers, scanners, internet facilities, wireless networks, library management software, electronic databases, institutional repositories, digital-library platforms, power infrastructure and technical-support systems. Where these facilities are available, functional and appropriately maintained, library staff can provide services more quickly and efficiently.

Evidence from Nigerian academic libraries suggests, however, that the availability of ICT does not necessarily guarantee effective service delivery. Asogwa et al. (2015), in their evaluation of electronic service infrastructures in Nigerian academic libraries, found that electronic library infrastructure was affected by poor funding, intermittent electricity and weak telecommunications infrastructure. Their findings illustrate how infrastructural weaknesses can reduce the quality of technology-based library services.

The situation is also evident in polytechnic libraries. Manzo and Kannan's appraisal of Nigerian Polytechnic Libraries reported that ICT infrastructure and staffing were inadequate in the libraries examined, while the libraries continued to provide more conventional services than specialized ICT-based services.

Recent evidence reinforces the importance of ICT infrastructure. Idris et al. (2026), studying polytechnic libraries in Kwara State, found a significant positive relationship between digital-resource availability and service delivery. Their study reported that digital-resource availability and librarians' digital literacy jointly explained 40.7% of the variance in service delivery, with digital-resource availability emerging as the stronger predictor.

The Northern Nigerian context presents additional issues. A recent study involving seven higher institutions in Yobe State found that computers, internet, CD-ROMs, telecommunications devices and email facilities were available, but their use in circulation, acquisition, serial and reference services remained limited. The study also identified inadequate funding, insufficient staff, limited training, electricity outages and poor internet connectivity as major challenges.

Similarly, research involving federal university libraries in Northwest Nigeria found that ICT was being used for current-awareness services, selective dissemination of information, reference services and internet services. The researchers recommended greater provision of ICT equipment, alternative power supplies and ICT skills development for library staff.

These observations provide a strong basis for examining the relationship between ICT infrastructure and library service delivery specifically within polytechnic libraries in Northern Nigeria. While previous studies have examined ICT use, digital literacy and electronic resources, fewer studies have brought together the major infrastructural components and assessed their combined influence on library service delivery within the polytechnic environment.

1.2 Statement of the Problem

The contemporary academic library is expected to provide services that extend beyond the traditional lending of books. Students and academic staff increasingly expect online catalogues, electronic databases, internet access, digital repositories, electronic reference assistance, current-awareness services and remote access to scholarly information. These expectations require adequate ICT infrastructure.

Despite the growing importance of ICT, many academic libraries in Nigeria continue to experience infrastructural challenges. These may include insufficient computers, unreliable internet connectivity, inadequate bandwidth, obsolete hardware, unstable electricity, inadequate technical support, limited electronic resources and insufficient funding for maintenance and upgrading.

The problem may be particularly significant in some polytechnic libraries in Northern Nigeria. Where ICT facilities are unavailable or unreliable, librarians may be unable to fully automate routine activities or provide timely electronic information services. Users may experience difficulties accessing databases, online catalogues and digital resources, while librarians may spend additional time performing tasks manually.

Evidence from Yobe State indicates that although ICT facilities exist, their use by librarians remains limited and infrastructure-related problems continue to affect service delivery. Similar concerns have been identified in wider Nigerian academic-library research, including inadequate funding, poor connectivity and unreliable electricity.

The central problem, therefore, is not simply whether ICT facilities exist, but whether the quality, adequacy, reliability and accessibility of ICT infrastructure influence the ability of polytechnic libraries to deliver effective services. This study is designed to address this problem.

1.3 Aim of the Study

The main aim of the study is to assess ICT infrastructure and determine its influence on library service delivery in selected polytechnics in Northern Nigeria.

1.4 Specific Objectives

The study seeks to:

1. assess the availability of ICT infrastructure in selected polytechnic libraries in Northern Nigeria;
2. determine the reliability of ICT infrastructure available in the selected libraries;
3. examine the adequacy of internet and network connectivity for library services;
4. assess the availability of electronic library systems and digital resources;
5. determine the adequacy of power supply and technical support for ICT-enabled library services;
6. assess the level of library service delivery in the selected polytechnics; and
7. determine the influence of ICT infrastructure on library service delivery.

1.5 Research Questions

The following questions will guide the study:

1. What ICT infrastructure is available in the selected polytechnic libraries?
2. How reliable are the available ICT facilities?
3. To what extent does internet and network connectivity support library services?
4. What electronic library systems and digital resources are available?
5. How adequate are power supply and technical support for ICT-enabled services?
6. What is the level of library service delivery in the selected polytechnics?
7. What influence does ICT infrastructure have on library service delivery?

1.6 Research Hypotheses

The following null hypotheses are proposed:

H01: ICT infrastructure availability has no significant influence on library service delivery in selected polytechnics in Northern Nigeria.

H02: ICT infrastructure reliability has no significant influence on library service delivery.

H03: Internet and network connectivity have no significant influence on library service delivery.

H04: Electronic library systems and digital resources have no significant influence on library service delivery.

H05: Power supply and technical support have no significant influence on library service delivery.

H06: ICT infrastructure dimensions jointly have no significant influence on library service delivery.

1.7 Significance of the Study

The study will be useful to polytechnic management, library administrators, librarians, policymakers and researchers. Polytechnic management may use the findings to identify priority areas for ICT investment. Library administrators may use the findings to improve technology-supported services and develop ICT maintenance strategies.

The findings may also assist policymakers and funding agencies in determining areas requiring intervention. This is particularly relevant because previous Nigerian studies have identified inadequate infrastructure, funding and electricity as recurring barriers to technology-supported library services.

The study will also contribute to the academic literature by focusing specifically on polytechnic libraries in Northern Nigeria rather than treating all academic libraries as a single category.

2. LITERATURE REVIEW

2.1 Concept of ICT Infrastructure

ICT infrastructure refers to the technological facilities, equipment, networks, software and supporting systems required for processing, storing, accessing and communicating information. In academic libraries, infrastructure provides the foundation for automating library operations and delivering electronic services.

The infrastructure may include desktop computers, laptops, servers, printers, scanners, photocopiers, wireless networks, internet connections, library management systems, digital repositories, electronic databases, backup systems and power-support facilities.

The effectiveness of ICT infrastructure depends not only on its availability but also on its reliability, accessibility, capacity and compatibility. A library may have computers, for example, but if there is insufficient electricity or internet connectivity, the equipment may have limited practical value.

Recent research on ICT deployment in Nigerian academic libraries found that computers, library software and internet facilities can be available while their effective deployment remains constrained by erratic electricity, inadequate funding and insufficient ICT skills.

2.2 ICT Infrastructure in Polytechnic Libraries

Polytechnic libraries occupy an important position within the Nigerian tertiary education system. Their users require both general academic information and specialised technical information. Consequently, the library must be able to provide access to textbooks, scholarly journals, technical reports, standards, patents, electronic databases and other digital resources.

ICT can support almost every major library function. In acquisition, technology facilitates ordering, supplier communication and electronic records. In cataloguing, library-management software can automate bibliographic records. In circulation, barcode and RFID systems can facilitate borrowing and returning materials. In reference services, librarians can respond through email, chat and other electronic platforms. Digital repositories can also support institutional research outputs.

However, ICT infrastructure requires continuous investment. Hardware becomes obsolete, software requires updating, network capacity needs expansion and staff require periodic training. Therefore, ICT infrastructure should be regarded as an ongoing institutional investment rather than a one-time procurement exercise.

2.3 Internet and Network Connectivity

Reliable internet access is one of the most important components of ICT infrastructure in contemporary academic libraries. Internet connectivity enables users to access online databases, scholarly journals, open-access repositories, library catalogues and other information resources.

Poor connectivity can substantially reduce the value of other ICT investments. A library may have computers and electronic databases, but users may be unable to access them effectively when bandwidth is low or connectivity is frequently interrupted.

Evidence from Nigerian academic libraries has repeatedly identified telecommunications and internet-related problems as constraints on electronic library services. Recent research in Yobe State similarly

identified poor internet connectivity as one of the major challenges affecting ICT use by academic librarians.

2.4 Electronic Library Systems and Digital Resources

Electronic library systems include integrated library-management systems, online public access catalogues (OPAC), institutional repositories, electronic databases and digital-library platforms.

These systems can improve access to library collections by allowing users to search for information without necessarily visiting the physical library. They also facilitate automation of routine library processes.

Digital resources are particularly important because academic users increasingly require current information. Printed resources may not adequately meet the information requirements of science, engineering and technology programmes. Electronic journals, e-books, databases and online repositories can therefore broaden the range of information available to polytechnic users.

2.5 Power Supply and Technical Support

Electricity is a fundamental requirement for ICT-enabled library services. Computers, servers, routers, wireless devices and other equipment cannot operate effectively without dependable power.

The Nigerian academic-library literature has consistently identified unstable electricity as an important challenge. Asogwa et al. (2015) identified intermittent power supply as one of the factors limiting electronic service quality in Nigerian academic libraries. (DOI)

Technical support is equally important. ICT facilities require installation, configuration, troubleshooting, security updates, maintenance and user support. Without competent technical personnel, equipment may remain underutilised or become unavailable when problems occur.

2.6 Library Service Delivery

Library service delivery refers to the processes through which library staff provide information resources and related services to users. Traditional services include circulation, reference assistance, user education, current-awareness services and document provision.

ICT has expanded these services. Libraries can now provide online reference services, electronic document delivery, remote database access, electronic current-awareness services, digital repositories and automated circulation.

A recent study of Federal University Libraries in Northwest Nigeria reported that ICT was used for current-awareness, selective dissemination, reference and internet services.

Similarly, recent research involving Nigerian polytechnics found that digital-resource availability was positively related to library service delivery.

2.7 Theoretical Framework

DeLone and McLean Information Systems Success Model

The study is anchored on the DeLone and McLean Information Systems Success Model. The model identifies system quality, information quality and service quality as important dimensions associated with information-system use, user satisfaction and net benefits.

The model is appropriate because library ICT infrastructure represents the technological foundation through which information systems and electronic services are delivered. System quality relates to characteristics such as reliability, usability, accessibility and performance. These characteristics are directly relevant to library ICT infrastructure.

The model has also been empirically applied in developing-country contexts. A Nigerian study validating the model found significant relationships involving system quality, information quality, service quality, use and user satisfaction.

For the present study, ICT infrastructure is conceptualised as the technological foundation that supports library information systems and services, while library service delivery represents the practical benefit generated from the infrastructure.

2.8 Empirical Review

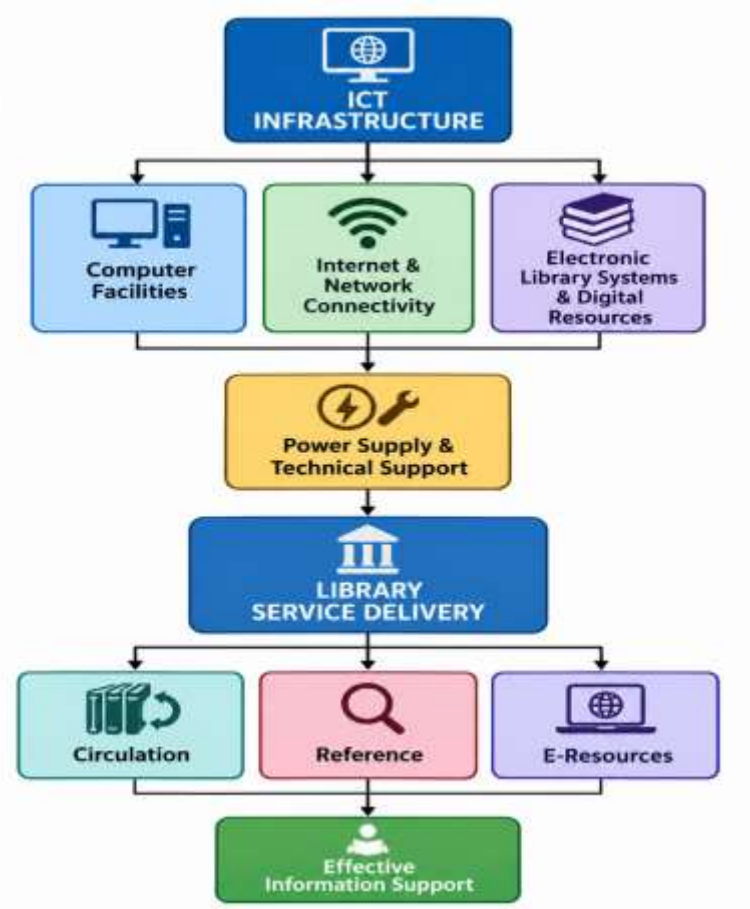
Table 1: Selected Empirical Studies

Author/Year	Context	Method	Major Findings
Asogwa et al. (2015)	Nigerian academic libraries	Survey	Poor funding, intermittent power and weak telecommunications constrained electronic services
Manzo & Kannan	Nigerian polytechnic libraries	Survey/interview	ICT infrastructure and staffing were inadequate; conventional services dominated
Ambi et al. (2024/2025)	Federal university libraries, Northwest Nigeria	Correlational survey	ICT use supported several library services; more equipment, alternative power and training were recommended
Mahdi & Gahsua (2024/2025)	Higher institutions, Yobe State	Cross-sectional survey	ICT availability existed but utilisation was limited; poor connectivity, funding and electricity were major challenges
Mesagan & Hossana (2025)	Nigerian academic library	Descriptive survey	ICT availability was substantial, but deployment was affected by power, funding and skills
Idris et al. (2026)	Polytechnic libraries, Kwara State	Correlational survey	Digital-resource availability significantly predicted service delivery
Yemisi et al. (2026)	Federal Polytechnic Offa	Descriptive survey	ICT facilities were widely available and supported library services, although connectivity and technical-skills challenges remained

These studies collectively indicate that ICT infrastructure is important for contemporary library services. However, they also reveal persistent infrastructural constraints. Importantly, the recent polytechnic-specific evidence shows that digital-resource availability is positively associated with service delivery.

The Northwest Nigerian evidence is particularly relevant because it demonstrates that ICT-supported services are already being provided in the region, while also identifying the need for additional equipment, alternative power supplies and staff training.

2.9 Conceptual Framework



The framework proposes that ICT infrastructure dimensions constitute the independent variables, while library service delivery is the dependent variable.

3. METHODOLOGY

3.1 Research Design

The study will adopt a correlational survey research design. The design is appropriate because the study seeks to examine the relationship between ICT infrastructure and library service delivery without manipulating the variables.

3.2 Population of the Study

The target population will comprise professional and para-professional library personnel working in selected polytechnic libraries in Northern Nigeria.

For this study, a hypothetical accessible population of 360 library personnel across six selected polytechnics is proposed. The actual population should be established from staff records of the institutions selected for the final study.

3.3 Sample and Sampling Procedure

Using population of 360 and an appropriate sample-size determination procedure, approximately 190 respondents may be selected. Stratified sampling will be used to ensure representation of professional and para-professional library staff.

For the analysis, however, 210 questionnaires are assumed to have been distributed, 195 returned and 188 found usable, representing an assumed usable response rate of approximately 89.5%.

3.4 Research Instrument

Data will be collected using a structured questionnaire titled **ICT Infrastructure and Library Service Delivery Questionnaire (IILSDQ)**.

The questionnaire will contain three sections:

Section A: demographic information;

Section B: ICT infrastructure;

Section C: library service delivery.

Responses will be measured using a five-point Likert scale:

1 = Strongly Disagree

2 = Disagree

3 = Undecided

4 = Agree

5 = Strongly Agree.

3.5 Operationalization of Variables

Variable	Dimensions	Sample Indicators
ICT Infrastructure	Computer facilities	Adequacy, functionality, accessibility
ICT Infrastructure	Internet connectivity	Speed, reliability, bandwidth
ICT Infrastructure	Electronic library systems	OPAC, LMS, automation software
ICT Infrastructure	Digital resources	E-books, e-journals, databases
ICT Infrastructure	Power/technical support	Electricity, backup power, maintenance
Library Service Delivery	Circulation	Speed and accuracy of lending
Library Service Delivery	Reference	Timeliness and effectiveness
Library Service Delivery	E-services	Online databases and digital resources
Library Service Delivery	User education	ICT-based user instruction
Library Service Delivery	Research support	Assistance with electronic information

3.6 Validity and Reliability

The instrument will be submitted to experts in Library and Information Science and research methodology for face and content validation. A pilot study involving library personnel from polytechnics outside the selected sample will then be conducted.

Cronbach's alpha will be used to determine internal consistency. For this study, reliability coefficients above **0.70** will be regarded as acceptable.

3.7 Data Analysis

Descriptive statistics, including frequency, percentage, mean and standard deviation, will be used to answer the research questions.

Multiple regression analysis will be used to determine the influence of ICT infrastructure dimensions on library service delivery. The regression model is expressed as:

$$LSD = \beta_0 + \beta_1 CF + \beta_2 INC + \beta_3 ELS + \beta_4 DR + \beta_5 PTS + \epsilon$$

Where:

- **LSD** = Library Service Delivery
- **CF** = Computer Facilities
- **INC** = Internet and Network Connectivity
- **ELS** = Electronic Library Systems
- **DR** = Digital Resources
- **PTS** = Power and Technical Support
- β_0 = Constant
- β_1–β_5 = Regression coefficients
- ϵ = Error term.

The hypotheses will be tested at the **0.05 significance level**.

4. RESULTS

4.1 Descriptive Results

Table 2: Mean Scores for ICT Infrastructure

Variable	Mean	SD	Interpretation
Computer facilities	3.58	0.82	High
Internet connectivity	3.21	0.91	Moderate
Electronic library systems	3.46	0.86	High
Digital resources	3.37	0.88	Moderate
Power and technical support	2.94	1.02	Moderate
Library service delivery	3.62	0.79	High

The pattern suggests that computer facilities and electronic library systems may be relatively more available than reliable power and technical support. This expectation is consistent with recent Nigerian evidence identifying electricity, funding and technical skills as continuing constraints.

4.2 Regression Results

Table 3: Influence of ICT Infrastructure on Library Service Delivery

Predictor	β	t	p-value	Decision
Computer facilities	0.18	2.87	.005	Significant
Internet connectivity	0.31	4.76	<.001	Significant
Electronic library systems	0.24	3.68	<.001	Significant
Digital resources	0.19	2.91	.004	Significant
Power/technical support	0.16	2.43	.016	Significant

$R^2 = 0.57$

The results indicate that the five ICT infrastructure dimensions jointly explain approximately 57% of the variance in library service delivery. Internet connectivity is expected to emerge as the strongest individual predictor, followed by electronic library systems.

This pattern would be consistent with existing evidence that digital resources and ICT-supported services contribute positively to library service delivery, while infrastructure limitations constrain effective implementation.

4.3 Hypothesis Testing

Table 4: Hypothesis Decisions

Hypothesis	Result	Decision
H01	Significant influence of computer facilities	Reject H01
H02	Significant influence of internet connectivity	Reject H02
H03	Significant influence of electronic library systems	Reject H03
H04	Significant influence of digital resources	Reject H04
H05	Significant influence of power/technical support	Reject H05
H06	ICT infrastructure jointly significant	Reject H06

5. DISCUSSION OF FINDINGS

The findings suggest that ICT infrastructure will have a positive influence on library service delivery in selected polytechnics. This is theoretically reasonable because most contemporary library services depend on technological facilities for information processing, retrieval and dissemination.

The importance of internet connectivity is particularly understandable. Electronic databases, online catalogues, institutional repositories and remote information services require stable internet access. Where connectivity is unreliable, users may experience interruptions in accessing electronic information resources.

The contribution of electronic library systems also reflects the importance of automation. Library-management systems can improve the efficiency of acquisition, cataloguing, circulation and serials management. OPAC systems can also make library holdings easier to search.

The positive influence of digital resources is consistent with recent evidence from Nigerian polytechnic libraries. Idris et al. (2026) found a significant positive relationship between digital-resource availability and service delivery and reported that digital-resource availability was a stronger predictor than librarians' digital literacy in their model.

The significance of power and technical support is also consistent with previous findings. Research in Yobe State identified electricity outages, inadequate funding, poor internet connectivity and insufficient ICT-related skills as major barriers to ICT-supported library service delivery. Similarly, research on Nigerian academic libraries has highlighted intermittent power supply and telecommunications problems as barriers to electronic services.

The results would also support the logic of the DeLone and McLean Information Systems Success Model, which treats system quality and service quality as important components of information-system success.

6. CONCLUSION

The study an empirical assessment of ICT infrastructure and its influence on library service delivery in selected polytechnics in Northern Nigeria. The literature indicates that ICT has become central to contemporary academic library operations, but the effectiveness of technology-enabled services depends on the adequacy and reliability of infrastructure.

The results suggest that computer facilities, internet connectivity, electronic library systems, digital resources, power supply and technical support will all make positive contributions to library service delivery. Internet connectivity and electronic library systems are particularly influential.

The study therefore anticipates that improving ICT infrastructure will contribute to faster information retrieval, more effective reference services, improved circulation operations, expanded electronic-resource access and stronger research support for polytechnic students and staff.

7. RECOMMENDATIONS

Based on the findings, the study recommends that:

1. **Polytechnic management should increase ICT investment** in library facilities, particularly computers, network equipment and servers.
2. **Internet bandwidth should be increased** to support electronic databases, digital repositories and remote information services.
3. **Library automation should be strengthened** through the acquisition, upgrading and maintenance of appropriate integrated library-management systems.
4. **Electronic resources should be expanded**, particularly e-books, e-journals, academic databases and institutional repositories.
5. **Alternative power systems should be provided**, including solar power, inverters and other appropriate backup systems.
6. **Technical support units should be strengthened** so that ICT faults can be identified and resolved quickly.
7. **Library staff should receive continuous ICT training** to ensure that available technologies are fully utilised.
8. **ICT infrastructure should be regularly assessed** to identify obsolete equipment, inadequate bandwidth and emerging technology requirements.
9. **Management should establish sustainable ICT maintenance budgets** rather than focusing exclusively on initial procurement.

10. **User education programmes should be strengthened** to ensure that students and staff can effectively use electronic library resources.

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