

Infrastructure, Access, and Satisfaction: Evaluating Digital Library Services at Federal University Dutse, Nigeria

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ABSTRACT

This study assessed the digital library infrastructure and service effectiveness of J.D. Amin Library, Federal University Dutse, Jigawa State, Nigeria. The study identified available digital library infrastructure, examined services provided to users, assessed accessibility and utilization, determined user satisfaction, and identified challenges affecting digital library service provision and use. A quantitative approach and descriptive survey design were adopted. The study population comprised 663 registered library users during the 2024/2025 academic session. Using the Yamane (1967) formula, 250 respondents were selected through simple random sampling. Of the 250 questionnaires distributed, 213 were returned and found usable, representing an 85.2% response rate. Data were analysed using frequency counts, percentages, mean, and standard deviation. The findings showed that basic ICT facilities, including computers, internet connectivity, and Wi-Fi, were available, whereas specialized infrastructure such as institutional repositories, OPAC, digitization equipment, and digital library platforms was limited. E-journals and e-books were the most utilized resources, while online databases, institutional repositories, and OPAC were less utilized. Users were most satisfied that digital resources met their academic needs, but reported lower satisfaction with internet speed, ease of access, and staff support. Inadequate training, low awareness, and poor internet connectivity were major challenges. The study concludes that strengthening specialized infrastructure, remote and online services, user education, and staff support is necessary to improve digital library effectiveness at J.D. Amin Library.

Keywords: Academic libraries; Digital infrastructure; Digital library; Federal University Dutse; Nigeria

1. Introduction

In Nigeria, the development of digital library infrastructure has gained momentum in recent years as universities strive to align with global best practices in information service delivery. Many academic libraries have introduced digital services such as online databases, electronic journals, web-based catalogues, and virtual learning spaces. Evidence suggests that a significant number of university libraries in Nigeria have established digital platforms including institutional repositories, library websites, and electronic resource management systems to facilitate access to scholarly materials (Omeluzor & Edewor, 2025). Furthermore, studies on the provision of digital information resources reveal that access to electronic resources in many Nigerian university libraries is still limited due to inadequate automation systems and insufficient integration of digital services into library operations. This situation affects the ability of libraries to provide real-time access to information and meet the evolving needs of users in a digital age (Igbo et al., 2022). In addition, issues such as low user awareness, poor information retrieval skills, and limited training opportunities contribute to the underutilization of available digital resources.

Conversely, inadequate infrastructure often leads to low usage of digital resources, thereby limiting the impact of library services on teaching and research. This underscores the importance of continuous assessment of digital library systems to identify gaps and improve service delivery. Against this backdrop, the need to assess digital library infrastructure and services in specific institutional contexts becomes imperative. The J.D. Amin Library of the Federal University Dutse, Jigawa State, represents a growing academic library operating within the Nigerian higher education system. As the university expands its academic programs and research output, the demand for efficient digital library services continues to increase. However, there is limited empirical evidence on the adequacy, accessibility, and utilization of digital library infrastructure in this institution.

The integration of digital technologies into academic libraries has significantly transformed information access, storage, and dissemination in higher education institutions. Digital libraries provide platforms for accessing electronic books, scholarly databases, online journals, institutional repositories, and other digital resources that support teaching, learning, and research activities. Consequently, universities are increasingly investing in digital library infrastructure such as computers, servers, internet connectivity, and digital information systems to enhance access to scholarly information. However, the effectiveness of digital library services largely depends on the adequacy of technological infrastructure, efficient management of digital resources, and the availability of user-friendly access systems within the library environment.

Despite the growing importance of digital libraries in academic institutions, many university libraries in developing countries, including Nigeria, continue to face several challenges in establishing and maintaining effective digital library systems. These challenges often include inadequate ICT infrastructure, limited internet bandwidth, unstable electricity supply, insufficient funding, and inadequate technical skills among library personnel. Such limitations can hinder the effective provision and utilization of digital library services, thereby restricting users' ability to access and benefit fully from available electronic information resources for academic and research purposes. Therefore, there is a need to assess the digital library infrastructure and services in J.D. Amin Library, Federal University Dutse. The study seeks to identify the types of digital library infrastructures available in J.D. Amin Library, Federal University Dutse, examine the digital library services provided to users, assess the level of accessibility and utilization of digital library resources and services, determine the level of user satisfaction with the digital library infrastructure and services and identify the challenges affecting the effective provision and use of digital library infrastructure and services in the library.

2. Literature Review

Research on digital libraries in Nigerian universities has grown quickly over the past decade, but it has grown unevenly. Studies of what libraries own are plentiful. Studies of what users do with what libraries own are fewer, and studies that connect the two inside a single institution are rarer still. The review below is arranged around the five objectives of this study, and each part closes by asking what the existing evidence establishes and where it stops.

2.1 Types of Digital Library Infrastructure Available in Universities

Digital library infrastructure refers to the technological framework, systems and resources that enable the collection, organization, storage, management and dissemination of digital information in libraries. Adeyemi and Adedokun (2022) describe this infrastructure in university settings as the arrangement of hardware, software, digital repositories and access platforms through which users search for and retrieve scholarly materials. The category is broad. It covers computers, servers and network capacity at one end and, at the other, the systems that give a collection its shape: institutional repositories that gather and preserve locally produced scholarship, metadata and knowledge organization schemes that make digital objects findable, and discovery layers and library portals that allow several databases to be searched through one interface (Omeluzor, Bamidele, Dika, & Ukangwa, 2021). Authentication systems and virtual private networks extend the same collections beyond the campus boundary (LIS Education Network, 2024).

Evidence from Nigerian universities points consistently to an imbalance within this category. Omeluzor et al. (2021) report that the state of digital library infrastructure constrains service delivery across the institutions they surveyed. Igbo, Ibegbulam, Asogwa and Imo (2022) attribute limited access to electronic resources to weak automation and to the partial integration of digital services into routine library operations. Idhalama, Oredo and Makori (2025) reach a similar conclusion for public university libraries, identifying infrastructure, funding shortfalls and user awareness as the constraints that shape accessibility.

Three weaknesses run through this body of work. The first is measurement. Availability is generally recorded as a checklist, which counts a desktop computer and an institutional repository as equivalent units, so a library can appear well equipped on a tally while lacking every system that turns a room of networked computers into a digital library. The second is the level at which the evidence is assembled. Multi-institution surveys aggregate across libraries at very different stages of development, and the aggregate conceals the imbalance that matters most for practice, which is the imbalance inside any one library between general connectivity and library-specific systems. The third concerns the kind of evidence available. Two of the most recent and most directly relevant Nigerian accounts are syntheses of published work rather than primary field studies (Idhalama et al., 2025; Olubiyo & Olubiyo, 2023), which leaves current first-hand evidence on the newer federal universities thin.

2.2 Digital Library Services Provided to Users in Universities

Digital library services are the electronic information services academic libraries deliver through digital technologies in support of teaching, learning and research (Adeniran, 2023). Olubiyo and Olubiyo (2023) observe that Nigerian university libraries now advertise a wide menu of such services, though these are often organized along traditional lines rather than designed for a digital environment. The menu usually includes access to subscribed e-books, e-journals and databases, online cataloguing and discovery through Online Public Access Catalogues and integrated discovery systems (Esew & Ikyembe, 2013; Borgman, 2022; Breeding, 2023), document delivery and interlibrary loan built on resource-sharing arrangements (Ifijeh, 2014; Kumar & Gupta, 2022; Singh & Satija, 2023), and remote access through proxy servers and cloud platforms that carry the collection to users off campus (Ifijeh, Adebayo, Izuagbe, & Olawoyin, 2023).

What the literature does less well is distinguish a service that exists on paper from a service that operates. Provision is commonly established from policy statements, library websites or reports by librarians rather than from the people the service is meant to reach. Where a service is absent, most studies drop it from the table rather than record the absence, so non-provision leaves no trace in the published evidence. That practice matters for the interpretation of low usage figures, because a resource that was never provided and a resource that was provided and ignored produce the same low number while calling for opposite responses.

2.3 Accessibility and Utilization of Digital Library Resources and Services

Ifijeh et al. (2023) separate accessibility, the ease with which users can locate and retrieve digital resources, from utilization, the extent to which those resources are actually used for academic work. Musungu and Maina (2023) argue that investment in digital infrastructure only becomes an academic return when both conditions hold. Access in practice depends on portals, repositories and databases, and on the orientation and information literacy programmes that equip students to work with them (Corrall, 2022). Adeniran (2023) reports that utilization concentrates on electronic journals, e-books and online databases, while Nwokedi and Idhalama (2021) find low utilization among university students and trace it to poor connectivity, weak digital literacy, limited awareness and difficulty in navigating library systems. Dulle and Minishi-Majanja (2021) describe comparable patterns across African academic libraries.

Two habits limit what this literature can tell us. Accessibility and utilization are frequently collapsed into a single measure, although they are different states and a resource can be perfectly reachable and entirely unused. Explanations for low use are then supplied after the fact from a standing list of barriers, with no account of why some resources are used heavily and others in the same library are not. Almost none of the studies reviewed here separates resources that a user can consult directly, such as an article or an electronic book, from resources that can only be reached through an intermediating system, such as a catalogue or a subscription database. That distinction is the obvious candidate explanation for uneven utilization, and it goes largely untested. A third habit follows from the first two. Non-use is read as a deficit in the user, rarely as a property of the system or of what was never supplied.

2.4 User Satisfaction with Digital Library Infrastructure and Services

Adeyemi and Adedokun (2022) define user satisfaction as the degree to which users judge that digital systems, resources and services meet their information needs. Muslim (2024) links satisfaction to the speed of retrieval and the quality of the digital environment, while Gbadebo (2025) approaches user behaviour in Nigerian university libraries through expectation and confirmation, treating satisfaction as the outcome of a comparison between what users expected and what they received. Sahabi and Unobe (2024) report on satisfaction with library services in a northern Nigerian tertiary institution, one of the few accounts from that region. Musungu and Maina (2023) argue for continuous feedback as a condition of service improvement.

Satisfaction is usually reported as a single composite score, or as a verdict of high, moderate or low. Averaging is convenient and it is also where the information goes. A composite score cannot show that the same users may accept the content a library provides while rejecting the means by which they must reach it, and that is a distinction with direct practical consequences, since the two call for different budgets. A related problem is that few Nigerian satisfaction studies tie their items to a named model, so a low score cannot be attributed to a particular dimension. It remains unclear whether users are dissatisfied with the system, with the information, or with the people who support them.

2.5 Challenges Affecting the Provision and Use of Digital Library Services

The constraints reported in this literature are stable and familiar. Esew and Ikyembe (2013) and Ifijeh (2014) identify limited ICT infrastructure, low bandwidth and ageing equipment as barriers to the operation of digital library systems in Nigeria. Igbo et al. (2022) add weak automation and incomplete integration of digital services. Muslim (2024) groups the constraints as technological, financial, organizational and user-related, and draws attention to the shortage of staff with skills in database management, digital preservation and metadata work. Unstable power supply and insufficient funding appear in nearly every account.

The consensus is itself worth questioning. Much the same list has been reported for more than a decade, which suggests that the field has settled on a description rather than an explanation. Studies seldom rank the constraints against one another, and almost none asks which category binds harder, so the policy inference defaults to the technical one: buy bandwidth, buy computers, restore power. Whether a comparable sum spent on user training and staff capacity would move utilization further is a question the evidence has not been designed to answer.

2.6 Gaps in the Literature

Four gaps follow from this reading. Availability is measured without distinguishing general-purpose ICT from the library systems that organize and expose a collection. Service provision is established from institutional sources rather than from users, and absence is not recorded. Utilization is explained by lists of barriers rather than by any property of the resources themselves. Satisfaction is aggregated to a point where the components that produce it can no longer be recovered. Underlying all four is a tendency to treat provision and effectiveness as the same thing, which is the assumption that the theoretical framework adopted here is designed to resist.

This study addresses those gaps in a single institutional setting. It separates general-purpose ICT from library-specific systems within one library and reports the ratio between them, rather than presenting an undifferentiated availability list. It records service categories that returned no responses at all, and treats that result as evidence rather than as a blank. It divides digital resources by whether their use requires an intermediating system, and compares utilization across that division. It disaggregates satisfaction by dimension and shows that acceptance of content and rejection of delivery can coexist among the same respondents. It also ranks user-related constraints against technical ones instead of assuming the priority of the latter. The setting adds a further contribution, since the reviewed evidence comes largely from southern Nigeria and from older, better-resourced institutions, and there is no published account of digital library provision at Federal University Dutse.

3. Theoretical Framework

The question behind this study is not whether J.D. Amin Library holds digital resources but whether what it holds reaches its users and makes a difference to their academic work. That question runs across three separate points: what the library provides, how users perceive and use what is provided, and what they gain from it. No single model spans all three. Saracevic (2000) offers a way of treating a digital library as an object of evaluation but leaves the choice of user variables open. Davis (1989) specifies those variables tightly, though he assumes that the technology already exists and that the user has met it. DeLone and McLean (2003) supply quality dimensions and outcome constructs, but their model was built for organizational information systems rather than for libraries. The three were therefore used together, with Saracevic's scheme as the organizing frame and the other two placed inside it to give measurable content to its broader categories.

3.1 Saracevic's Digital Library Evaluation Framework

Saracevic (2000) argues that the evaluation of a digital library must settle three matters before any measurement begins: the construct being evaluated, the context or level from which the evaluation is made, and the criteria and measures to be applied. The assumption underlying this is that a digital library is not one thing. It is a composite of hardware, collections, interfaces, services and people, and it can be judged from a systems perspective, from the perspective of individual users, or from that of the wider institution, with different verdicts at each level. Evaluating the technology on its own therefore says very little about the library.

Two considerations recommended the framework for this study. The first is that it refuses to treat provision as equivalent to effectiveness, which is precisely the equation the study set out to examine in a library where investment in equipment has not obviously produced a matching level of use. The second is that it can accommodate a digital environment that is only partly built, since it does not require a mature and fully integrated system before evaluation can proceed.

The framework also shaped the ordering of the objectives. Identifying the available infrastructure and examining the services provided belong to what Saracevic treats as the systems level. Assessing accessibility and utilization, and determining user satisfaction, shift the evaluation to the user level. Identifying the challenges affecting provision and use supplies the contextual element, since constraints of funding, skill and connectivity are properties of the setting rather than of the system or the user alone. The five objectives are therefore a descent from provision through use to constraint rather than an arbitrary list, and the questionnaire was arranged in the same order.

3.2 The Technology Acceptance Model

Davis (1989) proposes that the use of a technology can be explained by two beliefs held by the user, perceived usefulness and perceived ease of use, and that these beliefs mediate the influence of everything external to the user, including system design, training and institutional support. The model rests on two assumptions that matter for a library study. Use is treated as largely voluntary, and the user is assumed to have some acquaintance with the system, since a belief about usefulness has to be a belief about something the user has actually met.

The model was included because the central puzzle in this setting is variation in use among resources that are broadly equally available. Availability cannot explain why e-journals are consulted heavily while the catalogue is not, and a framework concerned only with provision has nothing to say about it. Davis's account predicts that resources whose academic value is immediately visible, and whose use demands little mediating skill, will be used most. It also predicts that training and awareness will operate as external variables working through ease of use rather than acting directly on behavior.

Two items in the satisfaction instrument were written as direct restatements of these constructs. The item on whether digital resources meet users' academic needs measures perceived usefulness, and the item on whether digital resources are easy to access measures perceived ease of use. The utilization objective supplies the behavioral side of the model, and the list of challenges put to respondents supplies the external variables. Because both beliefs are held by users rather than by systems, the unit of analysis is the user. This is the reason the study surveyed registered library users instead of auditing the library's holdings or interviewing management, and the reason utilization was measured by self-report rather than by system transaction logs.

3.3 The DeLone and McLean Information Systems Success Model

DeLone and McLean (2003) treat the success of an information system as multidimensional and, more importantly for this study, as interdependent. System quality, information quality and service quality shape use and user satisfaction, which in turn shape net benefits, so a system that performs well on one dimension may still fail if it is weak on another. The 2003 statement revised the authors' earlier model (DeLone & McLean, 1992) by adding service quality as a distinct dimension and by consolidating individual and organizational impact into net benefits.

That addition is the main reason the model was adopted alongside TAM. TAM says nothing about the quality of the resource being used and nothing at all about the people who support its use. In an academic library, staff mediation is part of the service rather than an external contingency, so a framework that leaves it out would miss one of the more plausible explanations for uneven utilization.

The model was operationalized directly in the satisfaction instrument. Items on internet speed, ease of access and the adequacy of digital facilities index system quality. The item on whether resources meet academic needs indexes information quality. The item on staff support indexes service quality. Use corresponds to the accessibility and utilization objective, and user satisfaction to the scale as a whole. Net benefits are represented by a single item on whether digital library services improve research and learning. That is a thin measure of a broad construct, and it is treated in the analysis as indicative rather than as a proper measure of benefit.

4. Methodology

The study adopted a quantitative research method using a descriptive survey research design and was conducted at J.D. Amin Library, Federal University Dutse, Jigawa State, Nigeria. The population comprised 663 registered library users during the 2024/2025 academic session. The sample size for the study was determined using the Yamane (1967) formula, $n = N / [1 + N(e)^2]$, where n is the required sample size, N is the total population size and e is the level of precision or margin of error.

Therefore, the calculated sample size was approximately 249 respondents, which was rounded to 250. The 250 respondents were distributed using a simple random sampling technique, giving eligible library users an equal chance of selection. Out of the 250 questionnaires distributed, 213 were returned and found usable, representing an 85.2% response rate. The questionnaire was subjected to face and content validity by experts in Library and Information Science, whose observations were used to improve the instrument. A pilot test was also conducted among similar library users who were excluded from the main study, and the overall result of the reliability test was .760, indicating that the instrument is reliable. Data collected were analyzed using frequency counts, percentages, mean, and standard deviation, and the findings were presented in tables for ease of interpretation. Ethical approval for the study was obtained from the relevant institutional authority at Federal University Dutse prior to data collection. Participation was voluntary, and informed consent was obtained from all respondents after they were briefed on the purpose of the study and assured that their responses would be treated with confidentiality and used strictly for academic purposes.

5. Results

Of the 250 questionnaires distributed, 213 were returned in usable form, an 85.2% response rate. Results are presented objective by objective. For the satisfaction items, which used a five-point scale, 3.00 is the scale midpoint, and a mean at or above 3.00 is read as satisfaction while a mean below it is read as dissatisfaction.

One feature of the data should be stated before the tables are read. The frequencies in Tables 1, 3 and 5 sum exactly to the sample size of 213, which indicates that respondents recorded a single response to each of these items. Their percentages therefore express the relative prominence of each option within the sample and not the proportion of users

who reported that the item was available, used or experienced. Table 2 permitted multiple responses and its percentages are computed on the base of 213 respondents, so they sum to more than 100%. Comparisons in this section are drawn within tables rather than across them, and the one place where a cross-table comparison is tempting is noted and set aside.

5.1 Objective One: Types of Digital Library Infrastructure Available

Table 1 presents the types of digital library infrastructure available in J.D. Amin Library, as reported by respondents.

Table 1: Types of Digital Library Infrastructure Available in J.D. Amin Library

Digital Library Infrastructure	Frequency	Percentage
Computers for accessing digital resources	50	23%
Internet connectivity	47	22%
Institutional repository	10	5%
Online Public Access Catalogue (OPAC)	9	4%
Subscription to electronic databases	19	9%
Digital library software/platform	20	9%
Scanners and digitization equipment	15	8%
Wireless internet (Wi-Fi)	43	20%
Total	213	100%

Computers for accessing digital resources were named most often, by 50 respondents (23%), followed by internet connectivity with 47 (22%) and wireless internet with 43 (20%). Digital library software or platforms were named by 20 (9%), subscription to electronic databases by 19 (9%), scanners and digitization equipment by 15 (8%), the institutional repository by 10 (5%) and the Online Public Access Catalogue by 9 (4%).

Grouping the items brings out the pattern more clearly than the ranking does. General-purpose ICT, meaning computers, internet connectivity and wireless internet, accounts for 140 responses, or 65.7% of the sample. Library-specific systems, meaning electronic database subscriptions, digital library software, digitization equipment, the institutional repository and the catalogue, account for the remaining 73 responses, or 34.3%. The ratio is close to two to one in favour of general connectivity.

Within the smaller group, the two systems whose function is to organize a collection and expose it to search, the institutional repository and the catalogue, together drew 19 responses, 8.9% of the sample and the two lowest values in the table. The library therefore possesses the equipment through which a digital collection is reached but is weakest in the systems that constitute a digital collection as something distinct from general internet access.

5.2 Objective Two: Digital Library Services Provided to Users

Table 2 presents the digital library services provided to users in J.D. Amin Library.

Table 2: Digital Library Services Provided to Users in J.D. Amin Library

Digital Library Services	Frequency	Percentage
Access to e-books	78	36.62%
Access to e-journals	71	33.33%
Online databases	48	22.54%
Electronic thesis and dissertation access	15	7.04%
Remote access to digital resources	0	0%
Online reference services	0	0%
Information literacy training on digital resources	24	11.27%
Document delivery services	15	7.04%
Total responses	251	117.8%

Note: Respondents were permitted to select more than one service. Percentages are calculated on the base of 213 respondents and therefore sum to more than 100%.

Access to e-books was reported most frequently, by 78 respondents (36.62%), followed by e-journals with 71 (33.33%) and online databases with 48 (22.54%). Information literacy training on digital resources was reported by 24 (11.27%), and electronic thesis and dissertation access and document delivery by 15 each (7.04%). Remote access to digital resources and online reference services each returned no responses.

The 213 respondents produced 251 service mentions in total, an average of 1.18 services each. That figure is low for a multiple-response item and indicates a narrow service repertoire rather than a broad one thinly used. Services that deliver content on site account for 197 of the 251 mentions (78.5%). Mediated and instructional services, that is information literacy training and document delivery, account for 39 (15.5%). Services that operate away from the library building or outside its opening hours account for none.

The two nil values deserve separate treatment because a zero in a sample of 213 is not a small number but a categorical result. Not one respondent identified remote access or online reference as a service they receive. The survey cannot determine whether this reflects non-provision, non-implementation of a service that exists in policy, or a complete failure of awareness, and each explanation carries a different remedy. What the result does establish is that neither service reaches any user in the sample, which places the library outside the model of contemporary digital provision described by Ifijeh et al. (2023) and Kumar and Gupta (2022), in which the collection follows the user rather than the user following the collection.

5.3 Objective Three: Accessibility and Utilization of Digital Resources

Table 3 presents the accessibility and utilization of digital library resources by users.

Table 3: Accessibility and Utilization of Digital Library Resources by Users

Digital Resource	Frequency	Percentage
E-books	61	28.64%
E-journals	75	35.21%
Online databases	34	15.96%
Institutional repository	22	10.33%
OPAC	21	9.86%
Total	213	100%

E-journals were the most used resource, reported by 75 respondents (35.21%), followed by e-books with 61 (28.64%), online databases with 34 (15.96%), the institutional repository with 22 (10.33%) and the catalogue with 21 (9.86%).

The division that matters here is not between resource types but between modes of access. Resources a user consults directly as documents, e-journals and e-books, account for 136 responses, or 63.8%. Resources reachable only through an intermediating system, that is online databases, the institutional repository and the catalogue, account for 77 responses, or 36.2%. Use of the first group is roughly 1.8 times use of the second. The gap holds even though the underlying content overlaps, since much of what is reached through a database is itself a journal article.

One apparent inconsistency should be addressed rather than left to the reader. Utilization of the institutional repository (22) and of the catalogue (21) exceeds the number of respondents who named those systems as available infrastructure in Table 1 (10 and 9). This is an artefact of the single-response format of both items and not a substantive contradiction, since a respondent who named computers as the infrastructure available to them could still name the catalogue as the resource they use. It does mean that neither table supports an estimate of prevalence, and the limitation is noted again at the end of the paper.

5.4 Objective Four: User Satisfaction with Digital Library Infrastructure and Services

Table 4 presents user satisfaction with digital library infrastructure and services.

Table 4: User Satisfaction with Digital Library Infrastructure and Services

Digital Library Services	SA N (%)	A N (%)	U N (%)	D N (%)	SD N (%)	Mean	SD
The digital library resources are easy to access	40 (18.8)	33 (15.5)	50 (23.5)	35 (16.4)	55 (25.8)	2.85	1.45
The internet speed in the digital library is satisfactory	30 (14.1)	35 (16.4)	45 (21.1)	45 (21.1)	58 (27.2)	2.69	1.39
The digital resources meet my academic needs	90 (42.3)	69 (32.4)	20 (9.4)	20 (9.4)	14 (6.6)	3.94	1.22
Library staff provide adequate support for digital resources	45 (21.1)	35 (16.4)	45 (21.1)	40 (18.8)	48 (22.5)	2.95	1.45
The digital library facilities are adequate	65 (30.5)	55 (25.8)	30 (14.1)	35 (16.4)	28 (13.1)	3.44	1.41
The digital library services improve my research and learning	55 (25.8)	46 (21.6)	35 (16.4)	40 (18.8)	37 (17.4)	3.20	1.45

Note: SA = Strongly Agree, A = Agree, U = Undecided, D = Disagree, SD = Strongly Disagree, N = 213.

Satisfaction was highest for the statement that digital resources meet users' academic needs ($M = 3.94$, $SD = 1.22$), followed by the adequacy of digital library facilities ($M = 3.44$, $SD = 1.41$) and the contribution of digital library services to research and learning ($M = 3.20$, $SD = 1.45$). Three items fell below the midpoint: staff support for digital resources ($M = 2.95$, $SD = 1.45$), ease of access to digital resources ($M = 2.85$, $SD = 1.45$) and internet speed ($M = 2.69$, $SD = 1.39$). The grand mean across the six items is 3.18, marginally above the midpoint, and the spread between the highest and lowest item is 1.25 scale points.

The split between the three items above the midpoint and the three below it is not arbitrary. The items above concern what the library holds and where users hold it, that is content and facilities. The items below concern how users reach that content: the speed of the connection, the ease of access and the help available when access fails. Acceptance of content and rejection of delivery therefore coexist within the same respondents, and a single composite satisfaction figure would have concealed the fact.

The agreement figures sharpen the picture. On the academic-needs item, 159 respondents (74.6%) agreed or strongly agreed against 34 (16.0%) who disagreed. On each of the three delivery items the balance reverses. Disagreement exceeded agreement on internet speed (103 or 48.4% against 65 or 30.5%), on ease of access (90 or 42.3% against 73 or 34.3%) and on staff support (88 or 41.3% against 80 or 37.6%). Between 21% and 24% of respondents were undecided on each of the three delivery items, compared with 9.4% on the academic-needs item, a level of neutrality that is itself consistent with limited exposure to the services in question.

Dispersion follows the same line. The narrowest standard deviation (1.22) attaches to the highest-rated item, so users agree most where they are most satisfied. The delivery items carry standard deviations of 1.39 to 1.45, meaning that experiences of access, speed and support vary considerably from one user to another in a way that judgements of content do not.

5.5 Objective Five: Challenges Affecting Digital Library Provision and Use

Table 5 presents the challenges affecting digital library infrastructure and services.

Table 5: Challenges Affecting Digital Library Infrastructure and Services

Challenges	Frequency	Percentage
Poor internet connectivity	40	18.78%
Inadequate computers	28	13.15%
Limited access to databases	34	15.96%
Lack of user awareness of digital resources	44	20.66%
Inadequate training on digital library use	47	22.07%
Frequent power outages	20	9.39%
Total	213	100%

Inadequate training on digital library use was the most frequently reported constraint, named by 47 respondents (22.07%), followed by lack of awareness of available digital resources with 44 (20.66%), poor internet connectivity with 40 (18.78%), limited access to databases with 34 (15.96%), inadequate computers with 28 (13.15%) and frequent power outages with 20 (9.39%).

Read as clusters, constraints on human capacity, that is training and awareness, account for 91 responses (42.7%). Technical and infrastructural constraints, that is connectivity, equipment and power, account for 88 (41.3%). Constraints

on content licensing, represented by limited access to databases, account for 34 (16.0%). The difference between the first two clusters is three responses, or 1.4 percentage points, and it would be wrong to read that as a ranking. The defensible statement is that human and technical constraints carry comparable weight in this library, which is itself a departure from the infrastructure-first framing that dominates the Nigerian literature.

Two individual results are worth isolating. The single most reported constraint is a training deficit rather than an equipment deficit. And frequent power outages, often assumed to be the binding constraint on digital services in Nigerian institutions, ranked last of the six.

5.6 Summary of Findings

Table 6 summarises the principal finding for each of the five objectives.

Table 6: Summary of Principal Findings by Objective

Objective	Principal Finding
One: infrastructure available	General-purpose ICT accounted for 140 responses (65.7%) and library-specific systems for 73 (34.3%). The institutional repository and the catalogue together drew 19 responses (8.9%).
Two: services provided	213 respondents produced 251 service mentions (1.18 each). On-site content delivery accounted for 197 mentions (78.5%). Remote access and online reference services returned nil.
Three: accessibility and utilization	Resources consulted directly as documents accounted for 136 responses (63.8%); resources reached through an intermediating system for 77 (36.2%).
Four: user satisfaction	Grand mean 3.18. Above the midpoint: academic needs met (3.94), facilities adequate (3.44), services aid research and learning (3.20). Below it: staff support (2.95), ease of access (2.85), internet speed (2.69).
Five: challenges	Human-capacity constraints 91 responses (42.7%); technical and infrastructural constraints 88 (41.3%); limited database access 34 (16.0%).

6. Discussion of Findings

The infrastructure result confirms the general picture reported by Omeluzor et al. (2021) and Igbo et al. (2022), in which Nigerian university libraries hold basic ICT but not the systems that make a digital library operate as one. What this study adds is the internal proportion. Two-thirds of reported provision is general-purpose connectivity, and the systems that organize and expose a collection are the two least present items in the table. Read through Saracevic's framework, the library has satisfied a condition at the systems level without completing the chain at the user level, and an evaluation that stopped at the availability count would have recorded the first and missed the second.

The service findings are the most consequential and the least anticipated by the literature. Remote access and online reference are treated as standard components of contemporary digital provision (Ifijeh et al., 2023; Kumar & Gupta, 2022; Singh & Satija, 2023), and both returned nil. In the DeLone and McLean scheme this is a service quality deficiency of a particular kind, since the dimension has no value rather than a low one. In TAM terms it is more serious than a low score, because a user cannot form a belief about the usefulness or ease of use of a service they have never met. The absence of online reference compounds the problem, since it removes the support that would otherwise convert a difficult first encounter into a successful one. The narrowness of the repertoire, 1.18 services per respondent, indicates that the library is delivering content rather than delivering services built around content.

Utilization behaved as the framework predicted, and the mechanism is visible in the data. Resources that arrive as documents are used at roughly 1.8 times the rate of resources reached through an intermediating system, even though the content overlaps. This is the perceived ease of use proposition operating at the level of the resource rather than the system, and it offers a more precise account of low database and catalogue use than the barrier lists offered by Nwokedi

and Idhalama (2021) and Adeniran (2023). It also suggests where an intervention would pay. The obstacle is not the collection but the interfaces between the user and it, which is a training and design problem rather than a subscription problem.

The satisfaction results give the clearest demonstration of the interdependence that DeLone and McLean posit. Information quality is strong, with 74.6% agreeing that the resources meet their academic needs. System quality and service quality are weak, with disagreement exceeding agreement on speed, access and staff support. The overall result is a grand mean of 3.18, barely above the midpoint. A dimension in good health has not compensated for two in poor health, which is precisely what an interdependent model predicts and what an additive one would not. It also explains a puzzle in the wider literature, where studies using composite scores report moderate satisfaction without being able to say what produced it. Disaggregation shows that in this library moderate satisfaction is not a moderate experience but the average of a good one and two poor ones.

On the challenges, the near-equality of human and technical constraints qualifies the reading offered by Eseye and Ikyembe (2013) and Ifijeh (2014), in which infrastructure is the primary limitation. Training and awareness together match connectivity, equipment and power, and training alone is the single most reported item. Corral (2022) argues that information literacy provision is central to digital transformation in academic libraries, and the pattern here supports that position more directly than it supports an equipment-led one. The low ranking of power outages is a further caution against inherited assumptions about what constrains Nigerian libraries.

Three expectations were carried into the analysis, and the results support two of them. Basic hardware and connectivity did not produce high satisfaction: computers, internet and wireless access were the most reported infrastructure, and every delivery item still fell below the midpoint. Resources with an obvious academic payoff were used more heavily than those requiring mediating skills, at 63.8% against 36.2%. The third expectation, that reported constraints would cluster on awareness, training and support rather than on equipment, is only partly supported. Human constraints did not exceed technical ones by any margin worth defending. They equalled them. Reporting this as confirmation would overstate what a difference of three responses can carry.

The reservation entered when the framework was set out proved warranted. TAM assumes a user deciding whether to adopt a technology they have encountered, and that assumption fails at the two nil cells, where the model has nothing to explain because there is nothing for a belief to attach to. The study therefore supports the framework's first and third assumptions, that effectiveness is a property of what users can do and that success dimensions constrain one another, and it qualifies the second. Beliefs mediate between provision and use only where provision has occurred. Where it has not, low utilization is a record of what the library did not supply, and Saracevic's insistence that the construct be defined before it is evaluated is the part of the framework that survives the encounter with these data best.

Taken together, the five sets of results describe a library whose effectiveness is limited less by the absence of digital content than by the absence of the systems, services and skills that connect users to it. The practical implication is that an integrated intervention is required. Acquiring more electronic resources, in isolation, would raise the dimension already performing well and leave the two that are holding satisfaction down untouched.

The researchers conclude that J.D. Amin Library holds digital content but has not yet built a digital library service around it. Its infrastructure is general-purpose rather than library-specific, resting on computers, internet and wireless access, while the catalogue and institutional repository, the systems that organise a collection and make it findable, remain the weakest provision in place. That imbalance carries into the services offered, which are narrow and tied to the building. Respondents named barely more than one service each, and not a single user reported remote access or online reference. Use follows from this pattern rather than from any indifference among readers, since resources that arrive as

documents are consulted far more often than those reached through a database, catalogue or repository, even where the content overlaps. Satisfaction reflects the same division. Users accept the content and reject the delivery, and because internet speed, ease of access and staff support each drew more disagreement than agreement, the overall result settled just above the scale midpoint. The constraints users reported complete the picture, with inadequate training the most common problem and power failure, usually assumed to dominate in Nigerian settings, ranking last. Effectiveness is limited less by what the library holds than by what stands between users and it.

7. Recommendations

Five recommendations follow from the objectives. The library should invest in library-specific systems rather than in further general ICT, giving priority to a functioning catalogue and an operational institutional repository, since these are the systems on which discovery and preservation depend. It should establish remote access and online reference services, which would extend provision beyond the building and supply support at the point where users encounter difficulty. It should target user education at the resources that require an intermediating system, since the utilization gap falls almost entirely on databases, the repository and the catalogue rather than on content the user meets directly. It should treat internet performance and staff capacity as the two dimensions holding satisfaction down, and address them together rather than sequentially, because content quality is already sufficient and further acquisition will not raise the overall result. Finally, the university should fund training and staff development at a level comparable to its investment in equipment, since the constraints reported by users fall in equal measure on both.

8. Limitations and Direction for Future Research

The study has some limitations. First, the study was conducted in only one institution, J.D. Amin Library, Federal University Dutse, which limits the generalizability of the findings to other university libraries with different technological, financial, and operational contexts. Second, the study relied on respondents' self-reported perceptions and experiences, which may have introduced response or self-report bias. Third, the frequency items on infrastructure, utilization and challenges each recorded a single response per respondent, so their percentages describe the relative prominence of options within the sample rather than the proportion of users reporting each one, and the figures in Tables 1, 3 and 5 should not be read as prevalence estimates. A multiple-response format, used for the service item in Table 2, would have supported stronger inference across all five objectives. Fourth, the study employed a cross-sectional survey design and collected data at a single point in time. Consequently, the study cannot establish how user satisfaction, accessibility, or utilization patterns may change following improvements in digital library infrastructure or service provision.

Future research should adopt longitudinal or repeated-measures designs to examine changes in users' satisfaction and utilization after specific digital library interventions, such as improved internet connectivity, implementation of remote access, establishment of online reference services, deployment of an institutional repository, or expansion of user-training programs. Comparative studies involving multiple Nigerian university libraries are also recommended to provide broader evidence on digital library infrastructure and service effectiveness.

References

- Adeniran, P. (2023). Utilization of electronic information resources by university students in Nigeria. *Nigerian Libraries Journal*, 56(1), 23–35.
- Adeyemi, B. M., & Adedokun, O. A. (2022). Digital library infrastructure and service delivery in Nigerian university libraries: An assessment of user satisfaction. *Library Philosophy and Practice*, 2022(1), 1–18.
- Borgman, C. L. (2022). *Big data, little data, no data: Scholarship in the networked world* (Updated ed.). MIT Press.

- Breeding, M. (2023). 2023 library systems report: The advance of open systems. *American Libraries*.
<https://americanlibrariesmagazine.org/2023/05/01/2023-library-systems-report/>
- Corrall, S. (2022). Information literacy and digital transformation in academic libraries. *Journal of Librarianship and Information Science*, 54(2), 165–178.
- Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 13(3), 319–340. <https://doi.org/10.2307/249008>
- DeLone, W. H., & McLean, E. R. (1992). Information systems success: The quest for the dependent variable. *Information Systems Research*, 3(1), 60–95. <https://doi.org/10.1287/isre.3.1.60>
- DeLone, W. H., & McLean, E. R. (2003). The DeLone and McLean model of information systems success: A ten-year update. *Journal of Management Information Systems*, 19(4), 9–30. <https://doi.org/10.1080/07421222.2003.11045748>
- Dulle, F. W., & Minishi-Majanja, M. K. (2021). The use of digital resources in academic libraries in Africa. *Information Development*, 37(3), 421–433.
- Esew, M., & Ikyembe, P. B. T. (2013). ICT and transformation of Nigerian libraries in enhancing educational development in academic institutions: Challenges and solutions. *Information and Knowledge Management*, 3(12), 53–58.
- Gbadebo, A. D. (2025). Digital library services and user behavior in Nigerian universities: An expectation-confirmation model analysis. *International Journal of Social and Educational Innovation*, 4(2), 34–46.
- Idhalama, O. U., Oredo, J. O., & Makori, E. O. (2025). Evaluating the availability and accessibility of digital resources and services in public university libraries in Nigeria. *Alexandria: The Journal of National and International Library and Information Issues*, 35(3). <https://doi.org/10.1177/09557490251335954>
- Ifijeh, G. (2014). Adoption of digital technologies in Nigerian academic libraries. *Journal of Academic Librarianship*, 40(3), 345–352.
- Ifijeh, G., Adebayo, O., Izuagbe, R., & Olawoyin, O. (2023). Digital library resources and services: A panacea for effective academic library service delivery in the 21st century. *Journal of Information Science Theory and Practice*, 11(1), 45–59.
<https://doi.org/10.1633/JISTaP.2023.11.1.4>
- Igbo, H. U., Ibegbulam, I. J., Asogwa, B. E., & Imo, N. T. (2022). Provision of digital information resources in Nigerian university libraries. *Information Research*, 27(3), 34–39.
- Kumar, R., & Gupta, D. (2022). Resource sharing and interlibrary loan services in the digital era. *DESIDOC Journal of Library & Information Technology*, 42(3), 145–152.
- LIS Education Network. (2024). Necessity of ICT infrastructure in university libraries.
<https://www.lisedunetwork.com/necessity-ict-infrastructure-university-libraries/>
- Muslim, S. A. (2024). Assessing the impact of digital transformation on access, user experience, and knowledge management in academic libraries. *Journal of Asian Multicultural Research for Educational Study*, 5(3), 45–54.
- Musungu, M. S., & Maina, J. (2023). Accessibility and utilization of information resources in the post-COVID-19 era: A case of selected university libraries in Kenya. *KLISC Journal of Information Science & Knowledge Management*, 1(1), 21–29.
- Nwokedi, V. C., & Idhalama, O. U. (2021). Digital library infrastructure and user satisfaction in academic libraries in South-South Nigeria. *Information and Learning Sciences*, 122(9/10), 625–640. <https://doi.org/10.1108/ILS-02-2021-0019>
- Olubiyo, P. O., & Olubiyo, L. M. (2023). Digital library services in university libraries in Nigeria: A literature study. *International Journal of Library and Information Science Studies*, 9(4), 1–12.
- Omeluzor, S. U., & Edewor, N. (2025). Assessing the university virtual library spaces for digital information services in Nigeria. *DESIDOC Journal of Library & Information Technology*, 45(1), 35–42.
- Omeluzor, S. U., Bamidele, I. A., Dika, Z. C., & Ukangwa, C. C. (2021). The state of digital library infrastructure and its effect on library service delivery in Nigerian universities. *International Journal of Library and Information Science*, 13(3), 45–56.
<https://doi.org/10.5897/IJLIS2021.0452>
- Sahabi, M. K., & Unobe, E. S. (2024). Gauging user satisfaction with library services in Nuhu Bamalli Polytechnic, Zaria, Kaduna State, Nigeria. *Nasarawa Journal of Library and Information Science*, 7(1), 70–79.
- Saracevic, T. (2000). Digital library evaluation: Toward evolution of concepts. *Library Trends*, 49(2), 350–369.
- Singh, J., & Satija, M. P. (2023). *Digital libraries and information access: Concepts and practices*. Chandos Publishing.
- Yamane, T. (1967). *Statistics: An introductory analysis* (2nd ed.). Harper & Row.