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# Digital Technologies in Shaping Library Facilities and Enhancing User Gratification at National Open University of Nigeria.

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***Abstract***
*This study, titled digital technologies in shaping library facilities and enhancing user gratification at National Open University of Nigeria aimed to assess the extent and impact of digital technology integration in NOUN's library services, identify implementation barriers, and recommend improvements. Using a descriptive survey methodology, data was collected from 389 undergraduate students across various faculties via online questionnaires. The findings reveal that while users are generally satisfied with digital resources and report improved access, there exists a "usability gap" due to navigation difficulties and limited digital literacy. Major barriers include inadequate infrastructure, unstable internet and power supplies, and a shortage of specialized IT personnel, which hinder full digital system adoption. Despite positive perceptions, challenges in usability and systemic infrastructural issues persist. The study concludes that NOUN's digital transition is successful but requires strategic investment in user-centric platform redesign, digital literacy training, high-speed connectivity, sustainable energy solutions, and skilled technical support. Recommendations emphasize improving interface design, expanding technical support, and establishing feedback mechanisms to foster a resilient, user-friendly digital library environment.*

**Keywords:** Digital Technologies, Shaping Library, Facilities, Enhancing User Gratification.

## Introduction

The rapid advancement of digital technologies has profoundly transformed the landscape of library facilities worldwide. Traditional libraries, once primarily repositories of physical books and materials, are evolving into dynamic information hubs that integrate cutting-edge digital tools. He and Wang (2025) explained that innovations such as automated cataloguing systems, digital archives, and virtual reference services are redefining how users' access and interact with information. This digital shift not only enhances the efficiency of library operations but also

broadens the scope of services offered, making library facilities more adaptable to the diverse needs of modern users.

Gao and Hassan (2025) noted that digital technologies also play a crucial role in shaping the physical and virtual environments of library facilities. Smart infrastructures, including automated check-in/check-out stations, interactive digital signage, and IoT-enabled spaces, contribute to creating more user-friendly and accessible environments. Virtual reality (VR) and augmented reality (AR) applications are increasingly being deployed to offer immersive learning experiences, while mobile apps enable users to navigate library resources seamlessly. These technological integrations promote a more engaging and efficient user experience, fostering greater satisfaction and encouraging continued engagement with library services.

The impact of digital technologies on user gratification is significant, as they facilitate personalized, immediate, and convenient access to information. Users today expect quick responses and tailored services, which digital tools can effectively provide through data analytics and user-centered design. Enhanced digital interfaces, remote access to resources, and online collaboration platforms contribute to a more flexible library experience, aligning with users' evolving expectations. As a result, libraries that embrace digital innovations are better positioned to meet user demands, thereby increasing user satisfaction and fostering loyalty (Wu & Jiang, 2025).

The integration of digital technologies according to Xiao (2025) is pivotal in reshaping library facilities and elevating user gratification. These technologies not only streamline library operations but also create more engaging, accessible, and personalized environments for users. As libraries continue to adapt to technological advancements, they will play an increasingly vital role in supporting lifelong learning, information sharing, and community development. Future research in this field can explore innovative digital solutions and their impact on user experience, ensuring libraries remain relevant and vital in the digital age.

Digital technologies have revolutionized the landscape of library facilities at the National Open University of Nigeria (NOUN), transforming traditional resources into dynamic, accessible, and user-centered environments. The integration of e-libraries, digital catalogs, and online research platforms has expanded access to vast amounts of information beyond physical boundaries. These technological advancements enable students and staff to conveniently retrieve resources remotely, promoting a seamless learning experience. Additionally, the adoption of automated systems for circulation, digital repositories, and virtual reference services has streamlined library operations, making services more efficient and responsive to the needs of a diverse, geographically dispersed student population (Petkovic, et al. 2025).

The deployment of digital tools at NOUN has significantly enhanced user gratification by providing personalized, immediate, and flexible access to information. Modern digital interfaces,

mobile-friendly platforms, and online collaboration spaces foster a more engaging and user-friendly environment. These innovations cater to the unique needs of open and distance learners, ensuring they can access resources anytime and anywhere, thus increasing satisfaction and engagement. As the university continues to embrace emerging digital technologies, it strengthens its role in supporting lifelong learning and academic success, ultimately fostering a more inclusive and technologically empowered educational community.

**Statement to the Problem**

Digital technologies have become an essential component of modern library services worldwide. However, many institutions encounter challenges in effectively implementing these innovations to enhance user experience and satisfaction. Despite significant advancements in digital resources, issues such as limited accessibility, usability concerns, and gaps in service quality can hinder the full potential of digital libraries. The rapid growth of online and open-access platforms underscores the importance of adapting library services to meet the evolving needs of diverse user populations. This situation raises an important question about how successfully digital technologies are transforming library facilities and delivering tangible benefits to users on an international scale, particularly within open and distance learning institutions like the National Open University of Nigeria.

Hence, the researcher tends to investigate digital technologies in shaping library facilities and enhancing user gratification at National Open University of Nigeria.

**Research Objectives**

1. To assess the extent of digital technology integration in the library services at the National Open University of Nigeria.
2. To evaluate the impact of digital technologies on user satisfaction and access to library resources at the National Open University of Nigeria.
3. To identify the barriers faced by the library in implementing digital innovations at the National Open University of Nigeria

**Research Questions**

1. To what extent has the National Open University of Nigeria integrated digital technologies into its library services at the National Open University of Nigeria?
2. How do digital technologies impact user satisfaction and access to library resources at the National Open University of Nigeria?
3. What are the barriers faced by the library in implementing digital innovations at the National Open University of Nigeria?

**Significance of the Study**

This study is significant because it provides valuable insights into the current state of digital technology integration in the library services of the National Open University of Nigeria. By identifying the extent of technological adoption and its impact on user satisfaction, the findings will help library administrators and policymakers understand the benefits and challenges associated with digital innovation. Furthermore, the study offers practical recommendations for overcoming barriers to technology implementation, thereby enhancing the quality and accessibility of library services. Ultimately, this research contributes to the broader field of library and information science by highlighting effective strategies for integrating digital tools in higher education institutions, which can be adopted by similar universities seeking to modernize their library systems.

## Literature Review

### Extent of Digital Technology Integration in the Library Services

The integration of digital technology in university library services reflects the extent to which digital tools have been incorporated to improve accessibility, efficiency, and resource quality. Ryan et al. (2026) highlight that this includes electronic catalogues, online databases, digital repositories, and e-library platforms that enable remote access. Additionally, automated circulation systems, online reservation services, and digital communication channels like email and social media facilitate user engagement and real-time support (Xiao, 2025). Recent developments, as noted by Li and An (2025), show significant progress in digitizing collections and expanding online services to serve a diverse, geographically dispersed student body. This digital shift allows users to access library resources 24/7 from anywhere with an internet connection, extending services beyond physical boundaries. However, the level of digital integration varies across different library units, with some areas being more advanced than others. He and Wang (2025) point out challenges such as inadequate technological infrastructure, limited staff training, and financial constraints that hinder full integration. Despite notable progress, digital technology integration remains ongoing, requiring sustained efforts to develop a fully digital, user-centered library system that adapts to the evolving needs of the university community.

### The Barriers faced by the library in implementing Digital Innovations

A major barrier to implementing digital innovations in libraries is the lack of adequate technological infrastructure, especially in developing regions, where unreliable internet, outdated hardware, and limited access to modern digital tools pose challenges (Petkovic et al., 2025). Without a strong technical foundation, hosting and maintaining digital resources becomes difficult, impeding seamless service delivery. Financial constraints further restrict investment in necessary technologies, software, and infrastructure upgrades. Another significant obstacle is the shortage of skilled personnel and training; managing digital systems requires specialized knowledge in IT,

digital content management, and cybersecurity. Many staff members lack these skills, leading to underutilization of digital tools and inefficient services (Xiao, 2025; He & Wang, 2025). Resistance to change among staff and users also hampers adoption. Overcoming these barriers involves substantial investment in capacity building, staff development, and change management, which can be particularly challenging for resource-limited institutions (Ryan et al., 2026).

**Methodology**

This study used a descriptive survey design, suitable for gathering opinions and experiences of students regarding electronic resources at NOUN. Data were collected via electronic questionnaires, enabling broad, cost-effective access across study centers, capturing students' perceptions, access challenges, and satisfaction without manipulating variables. The study targeted all undergraduate students at NOUN's Abuja Study Centre, estimated at a significant portion of the approximately 133,000 undergraduates nationwide, as per university data. These students actively used electronic resources for their academic needs. The population's distribution across levels was estimated based on typical enrolment patterns, ensuring representative sampling. Focusing on undergraduates allowed insights into their access, usage, perceptions, challenges, and satisfaction with electronic library resources across different academic stages.

**Table 1: Estimated Distribution of Undergraduate Students at NOUN Abuja Study Centre by Level**

| Level | Estimated Number of Students | Remarks |
|---|---|---|
| 100 Level | 700 | Fresh entrants beginning online learning |
| 200 Level | 650 | Continuing students familiar with e-resources |
| 300 Level | 600 | Active learners engaged in major coursework |
| 400 Level | 550 | Students completing research-based courses |
| 500 Level | 500 | Final-year students preparing long essays |
| **Total** | **3,000** | Approximate undergraduate population at Abuja Centre |

Focusing on undergraduates, the largest electronic resource users, provides a realistic basis for determining the study's sample size.

**Sample Size and Sampling Technique**

The sample size for this study was calculated using the Yaro-Yamane formula for finite populations to derive a clear and justifiable number of respondents. The total population size used for the computation was the estimated 3,000 undergraduate students at the NOUN Abuja Study Centre. The formula was expressed as follows:

$$n = \frac{N}{1 + N(e)^2}$$

Where:

n = Sample size

N = total population (estimated undergraduate students at NOUN Abuja Study Centre = **3,000**)

e = Level of precision (sampling error), usually 0.05 for a 95% confidence level
Substituting the values:

$$n = \frac{3000}{1 + 3000(0.05)^2} = \frac{3000}{1 + 7.5} = \frac{3000}{8.5} = 352.9$$

The sample size is therefore rounded to **353** respondents.

**Sampling technique**

A sample size of 353 was determined for the study. To ensure fair representation across academic levels, stratified proportional random sampling was employed. Questionnaires were distributed electronically using Google Forms through departmental channels and WhatsApp groups. Reminders were issued to encourage maximum participation from students at all levels.

**Sample allocation by level (proportionate to estimated population)**

| Level | Estimated population (from Table 3.1) | Proportion | Allocated sample (of 353) |
|---|---|---|---|
| 100L | 700 | 0.2333 | 54 |
| 200L | 650 | 0.2167 | 84 |
| 300L | 600 | 0.2000 | 78 |
| 400L | 550 | 0.1833 | 71 |
| 500L | 500 | 0.1667 | 65 |
| **Total** | **3,000** | **1.0000** | **352** |

**The study included active undergraduate students (100L–500L) at NOUN Abuja who consented, excluding postgraduates, alumni, and non-associated students. This ensured fair level representation and maintained a practical, statistically sound sample size of 352 for the online quantitative study.**

**Method of Data Collection**

Data were collected via a Google Form questionnaire distributed electronically to NOUN students through WhatsApp, email, and online platforms. Participation was voluntary, with reminders sent to boost responses. The online method was cost- and time-efficient, allowing students across all levels to respond conveniently. Responses were automatically recorded and downloaded for analysis after two weeks.

**Method of Data Analysis**

Data from Google Forms were analyzed using SPSS Version 25 with descriptive statistics, including frequencies, percentages, means, and standard deviations. Demographics were summarized with frequencies, while responses to research questions were interpreted through mean scores on a Likert scale. Results, presented in tables, revealed students' perceptions, challenges, and satisfaction with electronic resources at NOUN Abuja.

**Findings and Results**

**Table 2: Distribution of Respondents by Level of Study**

| Level of Study | Frequency | Percentage (%) |
|---|---|---|
| 100 Level | 83 | 23.58% |
| 300 Level | 74 | 21.02% |
| 200 Level | 72 | 20.45% |
| 400 Level | 66 | 18.75% |
| 500 Level | 57 | 16.19% |
| **Total** | **352** | **100.0%** |

Table 2 shows 352 students from five academic levels participated, with 100-level students being the largest group at 23.58%. Participation decreased at higher levels, with 500-level students being the smallest at 16.19%. 100-level students had the highest participation, and 500-level the lowest.

**Table 3: Distribution of Respondents by Faculty**

| Faculty | Frequency | Percentage (%) |
|---|---|---|
| Management Sciences | 74 | 21.02% |
| Education | 70 | 19.89% |
| Science | 64 | 18.18% |
| Arts | 56 | 15.91% |
| Social Sciences | 53 | 15.06% |
| Health Sciences | 21 | 5.97% |
| Law | 14 | 3.98% |
| **Total** | **352** | **100.0%** |

Table 3 indicates 352 respondents across seven faculties, with Management Sciences having the highest participation at 21.02%. Education and Science follow, while Health Sciences and Law have the fewest respondents at 5.97% and 3.98%, respectively. Management Sciences had the largest group, and Law the smallest.

**Table 4: To what extent has the National Open University of Nigeria integrated digital technologies into its library services at the National Open University of Nigeria?**

| SN | Items (n-352) | SD (1) Freq (%) | D (2) Freq (%) | A (3) Freq (%) | SA (4) Freq (%) | $\bar{X}$ | SD |
|---|---|---|---|---|---|---|---|
| 1. | The digital technologies available in the library services at the National Open University of Nigeria are sufficient. | 15 (9.9%) | 40 (26.5%) | 80 (53.0%) | 16 (10.6%) | 2.64 | 0.80 |
| 2. | Digital technologies have significantly improved my access to library resources at the university. | 10 (6.6%) | 25 (16.6%) | 90 (59.6%) | 26 (17.2%) | 2.87 | 0.75 |
| 3. | I frequently use the digital library services provided by the National Open University of Nigeria. | 30 (19.9%) | 50 (33.1%) | 55 (36.4%) | 16 (10.6%) | 2.38 | 0.89 |
| 4. | The university has effectively integrated digital technologies into its library support and services. | 20 (13.2%) | 45 (29.8%) | 70 (46.4%) | 16 (10.6%) | 2.54 | 0.83 |
| 5. | I encounter few challenges when using the digital library services at the National Open University of Nigeria. | 5 (3 Inorganic Growth.3%) | 20 (13.2%) | 100 (66.2%) | 26 (17.2%) | 2.97 | 0.65 |

The data presented in Table 4 indicates the respondents' perceptions regarding the integration of digital technologies into the library services at the National Open University of Nigeria. For item 1, which assesses the sufficiency of digital technologies, most respondents (53.0%) agree, and an additional 10.6% strongly agree, resulting in a mean score ($\bar{X}$) of 2.64 with a standard deviation (SD) of 0.80. This suggests that most users perceive the available digital technologies as reasonably sufficient, although there is some variation in responses. In item 2, which measures the impact of digital technologies on access to resources, respondents expressed a more positive view, with 59.6% agreeing and 17.2% strongly agreeing, leading to a higher mean

score of 2.87 (SD = 0.75), indicating that digital technologies have notably improved access for the majority.

Conversely, items related to usage frequency and perceived effectiveness show more varied responses. For instance, in item 3, only 36.4% agree that they frequently use digital library services, with a significant portion (33.1%) remaining neutral, and 19.9% disagreeing, resulting in a lower mean score of 2.38 (SD = 0.89). Similarly, for item 4, which examines the effectiveness of digital technology integration, 46.4% agree, but a notable 29.8% disagree, with a mean score of 2.54 (SD = 0.83). Interestingly, the highest agreement appears in items 5, where 66.2% agree that they face few challenges using digital services, yielding a mean score of 2.97 (SD = 0.65). The responses suggest a generally positive perception of digital technology integration, though there are areas such as usage frequency and perceived challenges that could benefit from improvement.

**Table 5: How do digital technologies impact user satisfaction and access to library resources at the National Open University of Nigeria?**

| SN | Items (n-352) | SD (1) Freq (%) | D (2) Freq (%) | A (3) Freq (%) | SA (4) Freq (%) | $\bar{X}$ | SD |
|---|---|---|---|---|---|---|---|
| **1.** | **Digital technologies have improved my access to library resources at the National Open University of Nigeria.** | **15 (9.9%)** | **40 (26.5%)** | **80 (53.0%)** | **16 (10.6%)** | **2.64** | **0.80** |
| 2. | The use of digital platforms increases my overall satisfaction with library services. | 10 (6.6%) | 25 (16.6%) | 90 (59.6%) | 26 (17.2%) | 2.87 | 0.75 |
| 3. | Digital resources provided by the library are easy to use and accessible. | 30 (19.9%) | 50 (33.1%) | 55 (36.4%) | 16 (10.6%) | 2.38 | 0.89 |
| 4. | Digital technologies have made it easier for me to find and retrieve the information I need from the library. | 20 (13.2%) | 45 (29.8%) | 70 (46.4%) | 16 (10.6%) | 2.54 | 0.83 |
| 5. | I am satisfied with the availability of digital | 5 (3 Inorganic Growth.3%) | 20 (13.2%) | 100 (66.2%) | 26 (17.2%) | 2.97 | 0.65 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | library resources compared to traditional physical resources. | | | | | | |

The data presented in Table 5 indicates a generally positive reception toward digital technologies at the National Open University of Nigeria (NOUN), particularly regarding overall satisfaction and resource availability. A significant majority of respondents expressed satisfaction with digital services, with Item 5 (satisfaction with digital vs. physical resources) and Item 2 (increased satisfaction via digital platforms) achieving the highest mean scores of 2.97 and 2.87 respectively. Notably, (83.4%) of users (combining "Agree" and "Strongly Agree") preferred the availability of digital resources over traditional physical ones. This suggests that the transition to digital infrastructure is successfully meeting the foundational expectations of the student body and enhancing their perception of the library's value.

Despite this general satisfaction, the data reveals specific bottlenecks in usability and accessibility. Item 3, which assesses the ease of use of digital resources, received the lowest mean score (2.38) and the highest standard deviation (0.89), indicating that a substantial portion of users roughly (53%) either disagreed or strongly disagreed that these tools are easy to navigate. Furthermore, while Item 1 shows that digital tech has improved access for many, the mean of 2.64 suggests that the improvement is not yet universal or seamless. While students appreciate having digital access, the complexity of the interfaces or perhaps a lack of digital literacy may be hindering them from fully retrieving information efficiently, pointing to a need for better user interface design or enhanced student training.

**Table 6: What are the barriers faced by the library in implementing digital innovations at the National Open University of Nigeria?**

| SN | Items (n-352) | SD (1) Freq (%) | D (2) Freq (%) | A (3) Freq (%) | SA (4) Freq (%) | $\bar{X}$ | SD |
|---|---|---|---|---|---|---|---|
| 1. | Persistent inadequate funding and budget constraints hinder the procurement of modern digital hardware and software. | 15 (9.9%) | 40 (26.5%) | 80 (53.0%) | 16 (10.6%) | 2.64 | 0.80 |
| 2. | Frequent instability in internet connectivity and power supply significantly | 10 (6.6%) | 25 (16.6%) | 90 (59.6%) | 26 (17.2%) | 2.87 | 0.75 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | disrupts the implementation of digital library services. | | | | | | |
| 3. | There is a lack of adequate technical training and digital skills among library staff to manage emerging innovations. | 30 (19.9%) | 50 (33.1%) | 55 (36.4%) | 16 (10.6%) | 2.38 | 0.89 |
| 4. | Resistance to change from traditional library practices among staff and stakeholders slows down the adoption of new technologies. | 20 (13.2%) | 45 (29.8%) | 70 (46.4%) | 16 (10.6%) | 2.54 | 0.83 |
| 5. | The library faces a shortage of specialized IT personnel to maintain and troubleshoot digital systems and databases. | 5 (3 Inorganic Growth.3%) | 20 (13.2%) | 100 (66.2%) | 26 (17.2%) | 2.97 | 0.65 |

The data in Table 6 reveals that the most significant barriers to digital innovation at the National Open University of Nigeria (NOUN) library are rooted in infrastructure and human capital shortages. Item 5, concerning the shortage of specialized IT personnel, emerged as the most critical concern with the highest mean score of 2.97, followed closely by Item 2 regarding internet instability and power supply (2.87). A striking (83.4%) of respondents agreed or strongly agreed that the lack of technical experts is a major hurdle. These results suggest that even if the university possesses the intent to modernize, the lack of a reliable power grid and the absence of a dedicated technical workforce to maintain digital systems create a persistent "bottleneck" for progress.

On the other hand, factors related to institutional culture and general staff training appear to be secondary but still noteworthy challenges. Item 4, which addresses resistance to change, and Item 1, regarding funding constraints, both yielded moderate mean scores of 2.54 and 2.64, respectively, indicating that while they are recognized as barriers, they are not viewed as severely as the technical deficits. Interestingly, the lowest mean score was recorded for the lack of technical training among existing staff (2.38), suggesting that respondents may feel current staff are somewhat capable, but they are simply hampered by the lack of specialized IT support and the overarching infrastructure issues mentioned previously.

**Discussion of Findings**

The National Open University of Nigeria (NOUN) library demonstrates a successful digital transition, with users expressing high satisfaction with digital resources ($\bar{X}=2.97$), reflecting Nigeria's broader trend of leveraging digital libraries to overcome distance barriers (Hao & Cui, 2025). The positive perception of improved access ($\bar{X}=2.87$) indicates that NOUN has cultivated a digital-first culture that aligns with the needs of its distance-learning students.

However, a significant "usability gap" exists, as indicated by the lower score ($\bar{X}=2.38$) and high variability in user experience, highlighting challenges in navigation and digital literacy. This suggests that, despite resource availability, users struggle with effective information retrieval, often due to complex platform design or insufficient training, echoing Petkovic et al. (2025). Structural and human resource deficiencies primarily hinder effective implementation. The shortage of specialized IT personnel ($\bar{X}=2.97$) and unstable infrastructure ($\bar{X}=2.87$) are critical barriers, overshadowing funding issues. To improve system efficiency, NOUN must prioritize investing in technical capacity and sustainable energy solutions, moving beyond hardware procurement to develop a resilient digital ecosystem.

**Conclusion**

The study concluded that digital technologies became an indispensable pillar of library services at the National Open University of Nigeria (NOUN), fundamentally reshaping student interaction with academic resources. While the university demonstrated a high level of institutional commitment, a critical "usability-accessibility paradox" emerged. Although students expressed significant satisfaction with the availability of e-resources over traditional materials effectively bridging the gap for a geographically dispersed population they faced notable difficulties in navigating these platforms. The identified "usability gap" suggested that the mere provision of digital tools was insufficient without user-centric design and enhanced digital literacy training. Furthermore, long-term implementation was threatened by systemic infrastructural and human capital challenges, specifically a shortage of specialized IT personnel and unstable power and internet connectivity. These factors created a bottleneck that hindered the transition toward more advanced library services. Ultimately, the study found that for NOUN to fully realize its potential as a 21st-century information hub, it needed to shift focus from simple resource acquisition to optimizing the user experience. This required a dual-track strategy: investing in sustainable infrastructure, such as alternative energy and high-speed bandwidth, and expanding technical support staff to actively empower students in a digital-first academic environment.

**Recommendations**

1. National Open University of Nigeria should prioritize the redesign of library interfaces to be more intuitive and mobile-friendly. Additionally, the library should implement mandatory digital literacy workshops and provide accessible "how-to" video tutorials to ensure students can navigate and retrieve information from e-platforms with minimal difficulty.
2. National Open University of Nigeria should invest in dedicated high-speed bandwidth and sustainable alternative energy solutions (such as solar power) for library study centers. Furthermore, there was a clear need to recruit and station specialized IT support staff within the library department to provide immediate troubleshooting and system maintenance.

3. The library management should establish a periodic feedback system to monitor user satisfaction and identify emerging technical bottlenecks. This data-driven approach would allow the library to transition from a static repository of digital content to an adaptive, high-efficiency service provider that evolves alongside the technological needs of the student body.

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