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USE OF INCLUSIVE TECHNOLOGY INFRASTRUCTURE FOR PROMOTING ACCESSIBILITY AND LIBRARY PATRONAGE IN UNIVERSITY LIBRARIES IN SOUTH-EAST, NIGERIA

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Abstract

This study empirically examined the influence of inclusive technological infrastructure on university library patronage across five Southeast Nigerian states: Abia, Anambra, Enugu, Imo, and Ebonyi. A structured questionnaire collected data from 200 participants (students, staff and persons with disabilities), measuring availability of inclusive technologies, staff training, institutional policy, and usage patterns. Guided by the Technology Acceptance Model (TAM)andSocial Model of Disability, the analysis employed descriptive statistics and correlation studies. Results revealed that inclusive infrastructure, especially general ICT access, assistive tools, and staff capacity, significantly correlated with library usage. Key findings include low accessibility of screen readers/Braille tools and moderate policy support. Recommendations center on procurement of assistive devices, staff training, policy reinforcement, and continuous evaluation to foster equitable access and academic engagement.

Keywords: inclusive technology, library patronage, university libraries, accessibility, assistive technology, Southeast Nigeria

Introduction

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University libraries are critical to academic development, serving as hubs for learning, teaching, and research. In the 21st century, the role of these libraries has evolved, necessitating the incorporation of both traditional and modern technologies to meet the increasingly diverse needs of their users. Inclusive technological infrastructure refers to a strategic integration of conventional resources, such as print materials, books imprint for publishers' selection, manual card filings, manual newspaper indexing and manual cataloging systems, with modern technologies such as Online Public Access Catalogs (OPACs), electronic databases, wireless internet access, and assistive tools for individuals with disabilities (Ifijeh & Yusuf, 2017). This inclusive approach ensures that library services remain accessible, functional, and beneficial to all categories of users, irrespective of physical ability, socioeconomic background, or digital literacy.

In Southeast Nigeria, which comprises Abia, Anambra, Ebonyi, Enugu, and Imo states, universities vary significantly in their adoption of inclusive technological infrastructure. While some institutions have adopted digital systems and assistive technologies, others still rely heavily on traditional print-based services due to challenges such as limited funding, poor electricity supply, and inadequate ICT training among library personnel (Okike, 2020). Consequently, the effectiveness of university libraries in meeting user needs and attracting consistent patronage is in question.

Previous studies have established a correlation between access to inclusive technologies and increased library usage. Ani, Esin, and Edem (2015) found that students

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in universities with advanced ICT services visited libraries more frequently and utilized services more effectively than those without. Similarly, Ugwu and Onyebinama (2022) demonstrated that the availability of assistive technologies significantly improved the patronage of visually and physically impaired users.

Despite the growing interest in inclusive library services, empirical data focusing specifically on the relationship between inclusive technological infrastructure and library patronage in Southeast Nigerian universities remain limited. This gap necessitates an investigation into how inclusivity in technological infrastructure affects library use, particularly in a region marked by both technological progress and systemic limitations.

Research Questions

The following research questions guided the study

1. What is the demographic pattern ofuniversity library users in southeast Nigeria?
2. What are the levels of inclusive technological infrastructure availabilityof university libraries in Southeast Nigeria?
3. How does inclusive technology availability influences library patronage in university libraries of Southeast Nigeria?
4. What are the strategies for improving accessibility and patronage through inclusive technology?

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Theoretical Framework

Technology Acceptance Model (TAM)

The TAM by Davis (1989) suggests that perceived usefulness and ease of use are critical determinants of technology adoption. When users perceive inclusive technology as helpful and accessible, they are more likely to use the library.

Social Model of Disability

This model shifts attention from individual impairments to societal barriers. Inaccessible technology and untrained staff are structural impediments that limit library engagement by disabled users (Oliver, 1990).

Together, these models underline the role of institutional infrastructure and perception in shaping user behavior.

Literature Review

The introduction of inclusive technological infrastructure in academic libraries has come up as a formidable force towards shaping the quality and accessibility of library services. With respect to university libraries in Southeast Nigeria, the combination of old and new technologies offers both opportunities and challenges in improving user patronage and engagement. Inclusive technological infrastructure refers to a blend of

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traditional resources (such as print collections and card catalogs) and modern digital tools (such as Online Public Access Catalogs (OPAC), e-resources, assistive technologies, and internet-enabled services) designed to meet the diverse needs of users irrespective of their socioeconomic status, geographic location, or physical ability (Nwachukwu & Eze, 2021).

Several studies have stressed the importance of technological inclusion in promoting increased library usage and relevance especially in developing countries.Study the rate of adoption of ICT in South East academic libraries, Ani, Esin, and Edem (2015) noted that access to digital resources significantly impacts the frequency of library visits among university students in Nigeria. This is particularly seen to be very glaring in the Southeast, where infrastructural differences between urban and rural institutions requires inclusive approaches that would help close the digital gap. Taking a critical assessment of the role of libraries in promoting accessibility to information in Nigeria, Edewor, Okite-Amughoro & Osuchukwu (2016), observedthat inclusive technologies, enable both traditional and modern users to find value in library services

Moreover, the role of assistive technologies cannot be overemphasized in creating inclusive learning environments. In a case study involving two federal universities in south West Nigeria Agboola & Bamigboye (2011) reported that technologies such as screen readers, magnifiers, and speech-to-text software enhance access for visually impaired and physically challenged users, promoting equity and increased patronage. This is in harmony with the findings of Ugwu and Onyebinama (2022), who reported that universities in the

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region with better inclusive infrastructure recorded higher usage by students with special needs.

However, the implementation of inclusive technology in university libraries in Southeast Nigeria is hindered by several factors. Limited funding, inadequate ICT infrastructure, inconsistent electricity supply, and a shortage of trained personnel remain persistent barriers (Okike, 2020). As reported by Ifijeh and Yusuf (2017), without strategic investment and policy support, efforts to foster inclusive technological adoption may fall short, thereby impacting library patronage adversely.

Nonetheless, libraries that have adopted hybrid models (where both old and new technologies are integrated) have witnessed improved user satisfaction and engagement. Nnadozie and Nnadozie (2019) assert that such libraries not only attract more users but also retain them by meeting their evolving academic and information needs through varied service delivery methods.

Studies show that inclusive infrastructure enhances academic engagement and retention (Omeluzor & Anyaegbu, 2019). However, the study by Omotayo (2021) on digital divide and technological barriers for the disabled in Nigerian academic libraries revealed that many Nigerian university libraries still lack inclusive infrastructure. Furthermore, Ibrahim *et al*. (2023)reported that lack of trained personnel to guide users with disabilities limits access to even available facilities.

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Other scholars like Echezona & Ugwuanyi (2022) recommended integrating accessibility policies and dedicated funding into university library planning. This study adds to the literature by empirically testing the extent of infrastructural inclusivity and its impact on library patronage in five states of Southeast Nigeria.

Methodology

A descriptive, cross-sectional survey targeted 200 library users(students and staff) from universities in Abia, Anambra, Enugu, Imo, and Ebonyi States. To ensure regional representation and institutional balance in analyzing the effect of inclusive infrastructure across Southeast Nigeria equal participant contribution from each state (40 respondents) and each institution (20 respondents) were sampled. Participants were selected using stratified random sampling. From each of the five (5) states two (2) universities were randomly selected and from each institution 20 library users were randomly selected and later categorized according to gender disability status and their different roles in the universities this gave a total population of 200 respondents

Distribution of Participants by State and Institution

State	Institution	No. of Respondents	Percentage (%)
Abia	Abia State University (ABSU), Uturu	20	10%
	Michael Okpara University of Agriculture (MOUAU), Umudike	20	10%
Total		**40**	**20%**

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Anambra		Nnamdi Azikiwe University (UNIZIK), Awka	20	10%
		Chukwuemeka Odumegwu Ojukwu University (COOU), Igbariam	20	10%
	Total		**40**	**20%**
Ebonyi		Ebonyi State University (EBSU), Abakaliki	20	10%
		Alex Ekwueme Federal University Ndufu-Alike (AE-FUNAI)	20	10%
	Total		**40**	**20%**
Enugu		University of Nigeria, Nsukka (UNN)	20	10%
		Enugu State University of Science & Technology (ESUT), Enugu	20	10%
	Total		**40**	**20%**
Imo		Imo State University (IMSU), Owerri	20	10%
		Federal University of Technology (FUTO), Owerri	20	10%
	Total		**40**	**20%**
Total			**200**	**100%**

The structured table shows the distribution of participants by state and institution based on the total of 200 participants across 5 states in Southeast Nigeria. From this table, two universities per state, with each contributing an equal or nearly equal number of participants (e.g., 20 per university) were sampled. Equal participant contribution from each state (40 respondents) and each institution (20 respondents) ensures regional

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representation and institutional balance in analyzing the effect of inclusive infrastructure across Southeast Nigeria.

A structured questionnaire measured: **Section A**: Demographic pattern of library usage showing gender distribution, roles of participants in the university, and disability status of participants in the different state institutions. **Section B**: Infrastructure availability (considering availability of screen readers, audio books, digital catalogs, ICT labs, Braille devices adjustable desks, staff training, and accessible policies) using Likert scale of 1–5: 1 = very low; 2 = low; 3 = moderate; 4 = High; 5 = very High) **Section C**: Usage patterns (visits and duration of visits), **Section D**: Perceived ease and usefulness. Data were analyzed in SPSS version 25 using descriptive statistics. Pearson correlation with values between -1 and 1that measures the strength and direction of relationship between two variables (infrastructure and visits per week or duration of each visit), and multiple regressions (that tests the relationship between two or more variables) for predicting patronage based on infrastructure dimensions were employed.

Pilot survey: Pilot survey of the study was carried out at Kogi state university, Anyingba, Kogi state. Kogi State was chosen because it is in the same geographical zone with the study areas and shares boundaries with two of the study areas – Enugu and Anambra states. Participants for the pilot survey comprise 20 randomly selected staff and students of the institution that are library users. Cronbach's alpha reliability pilot testing (n=20) was applied to test the internal consistency of the items in the pilot survey, where a common

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interpretation is excellent (≥ 0.90), good (0.800 -0.89), acceptable (0.700 – 0.79), questionable (0.600 - 0.69), and poor (< 0.60). The result yielded good reliability: Cronbach's α = .89.

Results and Discussion

Research Question One:What is the demographic pattern of university library users in southeast Nigeria?

Table 1: The demographic pattern of library users in southeast Nigeria with participants distribution by State and Institution

Demographic Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	108	54%
	Female	92	46%
Total		200	
Role	Student	160	80%
	Staff	40	20%
Total		200	
Disability Status	Persons with Disabilities	32	16%
	Persons without Disabilities	168	84%
Total		200	
State of Institution	Abia	40	20%
	Anambra	40	20%
	Ebonyi	40	20%
	Enugu	40	20%
	Imo	40	20%
Total		200	

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Respondents included 54% male, 46% female, mostly students (80%), with 16% identifying as having a disability (visual or mobility).

- Gender distribution is relatively balanced, with a slight male majority.
- The majority of respondents are students (80%), reflecting their dominant presence in university libraries with only 20% as staff.
- 16% are persons with disabilities, which is significant for studies focused on inclusivity.
- Equal representation from each of the five Southeastern states provides regional balance and increases the general outlook of the findings within the region.

This near parity in gender distribution suggests that the study sample reflects a relatively balanced male-to-female ratio common in Nigerian public universities. Although slightly more males participated, the gap is not significant enough to skew interpretations based on gender.
However, research by Adebayo (2021)andAlabi & Bakare (2020) found that male students often dominate library and ICT usage spaces due to higher enrollment rates in technology because of expected higher future financial reward, oriented programs and greater social mobility. It is essential to ensure that infrastructure planning considers gender equity to prevent exclusion in access to inclusive resources.

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The overwhelming majority of participants were students, which is appropriate for a study focused on library patronage, as students are the primary users of academic library services.

The 20% staff representation includes librarians, ICT personnel, and academic staff, who are key in policy implementation and service delivery. Their perspectives are critical to understanding both the user experience (students) and the provider capacity (staff) for inclusive technological services. This distribution is in line with similar research by Omeluzor & Anyaegbu (2019), who emphasized the importance of staff-student interaction in creating inclusive library environments. It also ensures a holistic understanding of both demand (students) and supply (staff) dynamics in university libraries.

This demographic profile is particularly important given the study's focus on inclusive infrastructure. The 16% representation of individuals with disabilities exceeds the national average of around 10% (WHO & World Bank, 2011) and enhances the validity of inclusion-focused analysis. Most participants with disabilities identified as visually impairedor havingmobility-relatedchallenges-two groups for whom inclusive technology (e.g., screen readers, adjustable furniture) is critical. The inclusion of staff highlights the need to build internal capacity for supporting inclusive policies. Staff must be equipped, trained, and motivated to help bridge technological and accessibility gaps.

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Equal participant contribution from each state (40 respondents) and each institution (20 respondents) ensures regional representation and institutional balance in analyzing the effect of inclusive infrastructure across Southeast Nigeria.

Research Question Two: What are the levels of inclusive technological infrastructure availability of university libraries in Southeast Nigeria?

Table 2: Meanlevels of inclusive technological infrastructure available in university libraries in Southeast Nigeria

Inclusive Infrastructure	Mean	Remark
Screen Readers	2.3	Low
Audio Books	2.5	Low
Digital Catalogs	3.7	Moderate
ICT Labs (General Use)	4.0	High
Braille Devices	2.1	Low
Adjustable Desks	2.7	Moderate
Staff Training (Inclusion)	2.4	Low
Accessibility Policy	2.9	Moderate

Availability of inclusive infrastructure in university libraries in Southeast Nigeria is shown in table 2. The result shows low availability of assistive tools, lack of staff training, moderate policy presence, and partial ergonomic (equipment to reduce fatigue) support While mainstream infrastructure is robust, the inclusive dimensions-especially for visually impaired and disabled users-remain grossly underdeveloped**.** General ICT tools are well-provided, but inclusive tools and training remain insufficient.

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ICT is the most available infrastructure component. General ICT laboratories typically include internet-enabled computers, printing services, and access to e-resources, which benefit all users. Universities prioritize ICT infrastructure for mainstream needs but may overlook specialized technologies for persons with disabilities. Omeluzor and Anyaegbu (2019) confirmed that ICT laboratories are well developed in Nigerian universities, especially with TETFund support. Screen readers are critical for blind or visually impaired users; converting text to audio. The low availability score reflects significant exclusion of this group. Paucity of screen readers severely hinders digital access and autonomy for visually impaired students. Alabi and Bakare (2020) emphasized that screen readers are foundational tools for inclusive digital literacy. The result reveals a scarcity of accessible academic content in audio formats. This limits opportunities for poor sighted users to engage in extensive reading or research. Adebayo (2021) noted the limited availability of accessible academic materials in Nigerian libraries. A positive indication shows that users can access catalog information electronically. Digital catalogs improve information retrieval and reduce reliance on physical browsing. This is a good step toward modern library services, but effectiveness depends on whether catalogs are accessible (e.g., screen-reader friendly). The very low score of braille suggests inadequacy and exclusion. The implication is that it will grossly restrict educational equity for blind users. Nwafor (2022) noted that most Nigerian university libraries lack functional braille resources. Low staff training indicates that staff are generally not adequately trained to assist users with disabilities. Even where tools exist, lack of human capacity hinders use. Adeogun (2012)

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earlier observed that most library staff in Nigerian universities lack training in inclusive service delivery. Moderate accessibly policy suggests that while some institutions have policy documents addressing accessibility, implementation may be weak. Absence of clear policy enforcement results in sporadic or symbolic inclusion.

Research Question 3: How does inclusive technology availability influences library patronage in university libraries of Southeast Nigeria?

Table 3: Frequency of library visits inclusive technology influences library patronage

Metric	Mean	SD
Visits per Week	3.4	±1.1
Hours per Visit	1.7	±0.8
Assistive Tools Usage	1.8	±1.0
Perceived Ease of Use	3.2	±0.9
Perceived Usefulness	3.3	±1.0

Table 3presents the usage metrics collected from 200 participants across five states in Southeast Nigeria, as part of an empirical study titled *"Effect of Inclusive Technological Infrastructure on Library Patronage in University Libraries" and the standard deviations of the metrics about their means.* These metrics provide insight into how frequently users interact with library services, their experience with inclusive technologies, and their perceptions regarding usefulness and ease of use. The metrics also show the standard deviation of each variable calculated as the square root of the variance. A low standard deviation (SD) indicates that the values tend to be close the mean of the set, while a high standard deviation indicates that the values are spread out over a wider range. This metric

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shows that participants visit the library on average 3 to 4 times per week, indicating moderate to high library engagement. The standard deviation of 1.1 suggests that usage is fairly consistent across respondents. On the average, users spend 1.7 hours per library visit, which suggests relatively brief but focused usage sessions. A standard deviation of 0.8 indicates some little variation, possibly based on users' goals (e.g., quick borrowing vs. prolonged reading or research). This score of 1.8-on a 5-point scale (1 = never, 5 = always)is very low, indicating that most users rarely use assistivetools, such as screen readers, braille displays, or magnification software. The SD of 1.0 shows little variability, likely reflecting that a minority of users (primarily persons with disabilities) make regular use of these tools. A score of 3.2 out of 5 suggests a slightly positive perception of how easy it is to navigate and use library systems and infrastructure. A relatively small SD (0.9) implies a fairly consistent perception among users. Participants rated the usefulness of inclusive and ICT infrastructure at 3.3**,** again suggesting moderate satisfaction. The standard deviation of 1.0 shows slight variability, with some users finding the tools more beneficial than others. Patronage is moderate, though accessible infrastructure is lacking.

This frequency of library visits of 3 to 4 times per week, portraying moderate to high library engagement with a standard deviation of 1.1 aligns with university academic routines, where students often need to access reading materials, ICT laboratories, or study spaces many times weekly. Regular library visitation implies that enhancing inclusive infrastructure could have a significant impact on a large portion of the academic

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population, including students with disabilities. According to Echezona & Ugwuanyi (2022), regular library use is often tied to the perceived reliability and relevance of available facilities. This hour per visit (1.7 hr per library visit) recorded could indicate limited seating or inadequate adaptive resources for long stays, especially for persons with disabilities. Improvements in comfort and accessibility (e.g., adjustable desks, more inclusive ICT tools) might increase time spent in the library, translating into better academic outcomes. Adebayo (2021) reported that ergonomic and inclusive designs in library settings positively influence user retention and engagement duration. The very low assistive tools usage score**,** indicate that most users rarely use assistive tools, such as screen readers, braille displays, or magnification software. Alabi & Bakare (2020) reported that in many Nigerian university libraries, assistive technologies are either absent or inaccessible due to lack of staff expertise or funding. The relatively high perceived ease of use of library facilities suggests a slightly positive perception of how easy it is to wade through and use library systems and infrastructure. A relatively small SD (0.9) implies a consistent perception among users. Most users find the available technologies usable but not exceptional in accessibility or intuitiveness. This finding agrees with the Technology Acceptance Model (TAM)**,** which states that perceived ease of use significantly affects users' willingness to adopt technology (Davis, 1989). Participants rated the usefulness of inclusive and ICT infrastructure at 3.3**,** again suggesting moderate satisfaction with a standard deviation of 1.0. While users acknowledge the value of current infrastructure, they may still perceive certain limitations, especially those related to inclusivity, access

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speed, or content relevance. Nwafor (2022) emphasizes that the usefulness of inclusive technologies directly affects user satisfaction and return visits to the library.

Research Question 4: What are the strategies for improving accessibility and patronage through inclusive technology?

Table4: Strategies for improving accessibility and patronage through inclusive technology

	Pearson Correlations (r)	
Inclusive technology	**Visits/week**	**Hours/visit**
Screen Readers	0.50**	0.48**
Audio Books	0.47**	0.45**
General ICT Access	0.58**	0.54**
Adjustable Desks	0.35*	0.30*
Staff Training	0.42**	0.40**
Accessibility Policy	0.38**	0.36**

p < .05; p < .01***

All the inclusive technologies considered correlated positively and significantly with usage (Table 4). The data reflect a disproportionate development of general versus inclusive technologies in university libraries in Southeast Nigeria. General ICT Access (r = 0.58, .54) showed strongest correlationsamong all variables. Screen Readers (r =0 .50,.48) wasstrong and significant relationship among all variables.Audio Books (r = 0 .47, .45) was strong with positive correlation.Staff Training (r = 0.42, .40) was moderate to strong

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relationship. Accessibility Policy (r = 0.38**,** .36)showed moderate correlation.Adjustable Desks (r =0 .35, .30*)* was lowest but still significant correlation.

The strongest correlation ofgeneral ICT access among all variables suggests that availability and quality of general ICT tools (computers, internet access, e-databases) significantly boost library visitation frequency and duration**.** Students and staff rely heavily on ICT for academic research and communication. Better ICT access encourages more frequent and longer use of library spaces.Omeluzor and Anyaegbu (2019), emphasize that ICT availability is a key predictor of library patronage. The strong and significant relationship of screen readers among the variables indicates that better provisions of screen readers is associated with increased library visits and longer stay, especially important for visually impaired users. When visually impaired students have access to screen readers, they are more likely to utilize library resources effectively and spend more time doing so. This supports Alabi & Bakare (2020), who reported that assistive tools greatly improve engagement for users with disabilities. Audio books facilitate accessible reading and learning for students who have visual impairments or reading difficulties; hence, the strong positive result recorded. This reinforces findings by Echezona & Ugwuanyi (2022), highlighting the importance of multimodal content delivery in inclusive library design. Moderate to strong relationship recorded by staff training shows that well-trained staff make library services more approachable, especially for users with diverse needs. Their support can influence users' decision to return frequently and stay longer. The

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moderate correlation recorded by policy accessibility indicates that libraries with well-communicated and implemented accessibility policies are more likely to see higher usage levels. Policies serve as both a framework and a signal to users that their needs will be accommodated. Adeogun (2012) observed that institutional policy is often the first step toward meaningful inclusion. Moderate and weaker but still significant correlation of adjustable desk with two key indicators of library usage (Visits per Week**,** andHours per Visit) indicate that physical infrastructure has a moderate but important impact, especially for those with mobility impairments. Comfort and accessibility of workspaces may enhance user retention, particularly for extended use. This is consistent with human-centered design principles that emphasize ergonomics in library spaces (Nwafor, 2022).

Finally, the presence of formal accessibility policies provides structural support that fosters a sense of inclusion and belonging, even if its direct impact is somewhat lower than other factors. These findings underscore the need for a holistic approach to inclusivity in library settings-where infrastructure, technology, human capital, and policy all work synergistically to enhance user engagement.

Recommendations

To promote accessibility and library patronage in university libraries in South-East, Nigeria especially in southeast Nigeria:

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i) Inclusive tools such as screen readers, braille, audio books to equip the universities should be procured.

ii) Librarians need to be properly trained and retrained in disability inclusions.

iii) Evaluation to foster equitable access and academic engagement should be regular and necessary.

iv) Inclusion of policies into institutional plans to formalize policy accessibility of inclusivity in higher institutions is necessary. Additionally,

v) Student unions, NGOs, and other stakeholders should be involved and engaged in the planning and feedbacks to enhance inclusivity.

Conclusion

Inclusive technological infrastructure-especially assistive tools, ICT alignments, staff training, and supportive policies-positively influences library patronage in Southeast Nigeria. Improving underdeveloped components can expand access, foster academic success, and enhance user satisfaction. The study confirms that inclusive technological infrastructure substantially predicts library patronage in Southeast Nigerian universities. While general ICT is well provided, key assistive tools and training are sorely lacking.

The correlation analysis demonstrates that inclusive technological infrastructure significantly affects library patronage, particularly among students with disabilities. The strongest predictors of usage are general ICT tools, screen readers, and audio books,

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confirming that digital inclusivity drives engagement**.** Complementary factors like staff training and clear accessibilitypolicie**s** further support library usage. These findings emphasize the need for holistic, user-centered development of university libraries in Nigeria.

The data reflect a disproportionate development of general versus inclusive technologiesin university libraries in Southeast Nigeria. While mainstream infrastructure is robust, the inclusive dimensions-especially for visually impaired and disabled users-remain grosslyunderdeveloped. Institutions must take a holistic approach that integrates technology, policy, and human capacity to build fully inclusive academic environments.

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