

# ARTIFICIAL INTELLIGENCE AVAILABILITY, ACCESSIBILITY AND KNOWLEDGE SEEKING BEHAVIOUR OF VISUALLY IMPAIRED STUDENTS IN PUBLIC UNIVERSITY LIBRARIES IN SOUTH EAST NIGERIA

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## Abstract

This study examined artificial intelligence availability, accessibility and knowledge seeking behaviour of visually impaired students in public university libraries in South-East Nigeria. Three research questions guided the study. Descriptive survey research design was used for this study. The population of the study comprised all the 172 visually impaired students in the five Federal universities in South-East Nigeria. Census study was conducted and there is no sampling for the study since the population is of a manageable number. Data for this study was collected using structured questionnaire. The questionnaire covered three clusters A, B and C. The face and content validity of the research instrument was established through expert judgment. The Cronbach's Alpha method was used to determine the internal consistency of the questionnaire items and the reliability coefficient of 0.86, 0.70 and 0.74 were obtained for clusters A, B and C respectively. Out of 172 copies of visually impaired students that were given copies of the instruments, 170 copies were retrieved. This gives a retrieval rate of 98%. The data gathered through questionnaire were analyzed using descriptive statistics of frequency counts, percentages, mean and standard deviation. The finding revealed that only a limited range of AI tools is available in university libraries, with screen readers, OCR systems, speech-to-text, and text-to-speech tools being the most commonly reported in university libraries in South-East Nigeria. It was also found out that AI tools such as screen readers and text-to-speech systems are relatively accessible, others like OCR tools show lower accessibility levels, indicating inconsistency in usability across university libraries in South-East Nigeria. University libraries in South-East Nigeria, in collaboration with university management and relevant government agencies, should prioritize the provision of a wider range of AI tools that promote independent learning.

**Keywords:** Accessibility, Artificial Intelligence, Availability, Knowledge Seeking Behaviour, Visually Impaired Students

## Introduction

Artificial Intelligence (AI) refers to the simulation of human intelligence in machines designed to perform tasks that typically require human cognition. Russell and Norvig (2020) described AI as the study of intelligent agents that perceive their environment and take actions to maximize their chances of success. Nilsson (2018) viewed AI as the activity of developing computational models that enable computers to perform tasks that normally require human intelligence. Similarly, Goodfellow, Bengio and Courville (2016) explained AI as the use of algorithms and statistical models that enable machines to improve performance on tasks through experience. Operationally, AI refers to computational technologies that enable machines to process, analyze, and respond to human information needs, particularly within the context of availability and accessibility for visually impaired students in university libraries.

The transformative potential of AI lies in its ability to bridge the gap between human limitations and machine efficiency. Within university libraries, AI can serve as a vital medium for enhancing accessibility and supporting the information needs of visually impaired students. Intelligent systems can help users locate, retrieve, and utilize academic resources in more accessible formats through technologies such as screen readers, speech recognition systems, voice assistants, optical character recognition, and predictive text applications. Through these technologies, visually impaired students can interact more independently with library systems and digital learning resources.

Despite the importance of these AI-driven technologies, their availability in university libraries, particularly in South-East Nigeria, appears limited. Availability in this context refers to the presence and provision of relevant AI-based assistive technologies within library systems. Empirical evidence suggests that only a small proportion of university libraries in the region possess functional assistive AI technologies, with few digital repositories meeting international accessibility standards (Emenyonu and Uche, 2023). Although some libraries have introduced

basic technologies such as screen readers and voice assistants, more advanced AI applications including intelligent search systems, automated summarization tools, and adaptive learning interfaces remain largely unavailable (Horsfall and Opara, 2023). This inadequate availability restricts visually impaired students from fully benefiting from digital academic resources and weakens the goal of inclusive education.

Beyond availability, accessibility represents another major concern in determining the effectiveness of AI-driven technologies for visually impaired students. Accessibility refers to the ease with which visually impaired students can independently and effectively utilize available AI technologies. It includes factors such as user-friendly interfaces, compatibility with assistive devices, voice-command functionalities, and the ability of systems to convert digital content into accessible formats (Wanyama and Kimani, 2021). In many university libraries in South-East Nigeria, accessibility challenges persist despite the existence of some assistive technologies. Studies reveal that outdated software, inadequate internet connectivity, poor maintenance culture, irregular electricity supply, and lack of technical support significantly limit the usability of available technologies (Iroeze, Chima-James, Nneka and Opara, 2018). Furthermore, inadequate user training often forces visually impaired students to rely on peers or library staff to access academic materials (Kiambati, 2021). These accessibility gaps not only hinder effective utilisation of AI tools but also contribute to frustration, reduced motivation, and academic inequality among visually impaired students, affecting their information needs.

The interaction among AI availability, and accessibility significantly influences the knowledge-seeking behaviour of visually impaired students. Knowledge-seeking behaviour refers to the processes through which individuals search for, access, retrieve, and utilize information for academic and personal purposes (Agabirwe, 2020). For visually impaired students, this behaviour is strongly influenced by the extent to which AI technologies are available, accessible, and functional. Where AI tools are adequately provided and user-friendly, students are more likely to demonstrate greater independence, enhanced reading efficiency, and improved academic engagement (Garcia et al., 2022). Conversely, where such technologies are unavailable or difficult

to use, students often resort to alternative strategies such as depending on peers, library staff, or personal devices with better accessibility features (Adesina, Toyese, Ambali and Otonekwu, 2022).

Knowledge-seeking behaviour is also shaped by students' level of digital literacy, institutional support, and familiarity with AI technologies. The effective utilization of AI tools depends largely on the availability of training programmes and technical assistance that equip students with the necessary competencies for independent use (Abdulsalam, Aina, Issa and Fajonyomi, 2023). Unfortunately, many university libraries in South-East Nigeria lack structured training programmes specifically designed for visually impaired students, thereby limiting their ability to maximize the benefits of available AI technologies (Osadebe, Onuigbo and Ewa, 2019).

Although previous studies (Ibrahim, Quadir and Abdurrahman, 2024; Phukubje and Ngoepe, 2017; Osman and Kwafoa, 2020) have examined library services for visually impaired students, there appears to be limited empirical research that integrates AI availability, accessibility, information needs, and knowledge-seeking behaviour Federal universities in South-East Nigeria. Existing literature has focused largely on general accessibility challenges with insufficient attention given to AI-specific technologies and institutional variations in their provision and utilization (Horsfall and Opara, 2023). It is against this backdrop that this study investigated artificial intelligence availability, accessibility, information needs, and knowledge-seeking behaviour of visually impaired students in public university libraries in South-East Nigeria.

### **Statement of the Problem**

Many visually impaired students reportedly experience difficulties in accessing AI-driven assistive technologies due to poor availability of the required tools, inadequate digital

infrastructure, limited internet connectivity, outdated software, and lack of institutional support. In some universities, basic assistive technologies seem to be either completely unavailable or insufficient to meet the growing academic demands of students. Even where some AI tools exist, they are often difficult to use because of poor maintenance, lack of compatibility with digital resources, irregular power supply, and inadequate training for both students and library staff. Consequently, many visually impaired students still depend heavily on peers, personal devices, or manual assistance to access academic materials and library resources

The situation may further vary between Federal and State-owned universities in South-East Nigeria due to differences in institutional funding, technological infrastructure, policy implementation, and administrative support for inclusive education. Federal universities are often perceived to possess relatively better funding opportunities, stronger ICT infrastructure, improved internet connectivity, and greater access to technological innovations compared to many State-owned universities. These differences may influence the extent to which AI-driven assistive technologies are available and accessible to visually impaired students. In contrast, some State-owned universities may face more severe challenges relating to inadequate funding, poor maintenance culture, irregular electricity supply, and limited technological investments, which may hinder the effective provision and utilization of AI tools within their libraries. As a result, the relationship between AI availability, accessibility, information needs, and the knowledge-seeking behaviour of visually impaired students may differ depending on whether the institution is Federal or State-owned

If this situation persists without adequate intervention, visually impaired students may continue to face serious academic and social disadvantages within the university system. The inability to effectively access and utilize academic information may negatively affect their learning outcomes, research participation, academic performance, self-confidence, and overall educational experience. Continued exclusion from AI-driven library services may also widen the digital divide between visually impaired students and their sighted counterparts, thereby limiting equal participation in higher education. Despite the growing global attention on AI and inclusive education, there is still limited empirical evidence on the extent to which AI availability and accessibility influence the knowledge-seeking behaviour of visually impaired students in university libraries, particularly in South-East Nigeria. This backdrop therefore informed this study. On this premise, the following specific objectives were formulated:

1. examine the AI information tools available to visually impaired students in university libraries in South-East, Nigeria.
2. examine the accessibility of AI information tools for visually impaired students in university libraries in South-East, Nigeria.

3. investigate the knowledge seeking behaviour exhibited by visually impaired students in meeting AI information university libraries in South-East Nigeria

## **Research Questions**

The following research questions guided the study:

1. What AI information tools are available to visually impaired students in university libraries in South-East Nigeria?
2. What is the level of accessibility of AI information tools for visually impaired students in university libraries in South-East Nigeria?
3. What knowledge-seeking behaviours do visually impaired students exhibit towards meeting AI needs in university libraries in South-East, Nigeria?

## **Theoretical Underpinning**

### **Technology Acceptance Model (TAM) by Davis in 1989**

The Technology Acceptance Model (TAM) was propounded by Fred D. Davis in 1989. TAM posits that an individual's decision to use a technology is primarily determined by their behavioural intention to use it, which is the immediate precursor to actual system use. Behavioral intention, in turn, is shaped by two key beliefs about the technology. The first, perceived usefulness (PU), is defined as "the degree to which a person believes that using a particular system would enhance his or her job performance" (Davis, 1989, p. 320). In essence, if a user believes that a technology will make their tasks more efficient, productive, or effective such as speeding up work or improving output quality they are more likely to intend to use it. For example, a worker might perceive a new software system as useful if it reduces manual data entry time.

The second construct, perceived ease of use (PEOU), refers to "the degree to which a person believes that using a particular system would be free of effort" (Davis, 1989, p. 320). This reflects the user's perception of how simple or intuitive the technology is to operate. A system that requires minimal training or mental effort such as one with a clear interface or straightforward commands is seen as easier to use, increasing the likelihood of acceptance. Davis emphasized that

perceived ease of use not only directly influences behavioral intention but also indirectly affects perceived usefulness. If a technology is easy to use, users are more likely to recognize its utility, as the reduced effort enhances their ability to leverage its benefits effectively.

The original TAM framework is visually represented as a causal model with arrows indicating relationships: external variables (e.g., system design features, training, user characteristics) influence perceived usefulness and perceived ease of use; these two beliefs then determine attitude toward using the technology, which shapes behavioral intention, ultimately leading to actual system use. Notably, Davis found that attitude, while part of the model, was less significant than direct links from perceived usefulness and ease of use to intention, leading to later refinements where attitude was sometimes omitted for parsimony. In its essence, TAM's original form is a concise, user-centered model focused on cognitive perceptions rather than emotional or social factors, distinguishing it from broader theories like TRA. It provides a foundational lens for studying technology adoption, adaptable to contexts like visually impaired students using AI tools in libraries, by framing their acceptance based on how useful and effortless they find these technologies.

In relation to this study, perceived usefulness directly relates to how visually impaired students believe that AI tools (e.g., screen readers, voice recognition software, AI-powered cataloguing systems) can improve their access to academic resources and fulfill their information needs. If students perceive these technologies as helpful in completing their academic tasks more efficiently, they are more likely to embrace and use them frequently. For students with visual impairments, accessibility features—such as voice-guided navigation, tactile interfaces, and audio search functionalities—play a crucial role in determining whether the technology is user-friendly. If AI tools are difficult to navigate or lack inclusive design, their adoption may be hindered, regardless of their usefulness. While TAM covers specific aspects of the variables of the study, it lacks in the area of knowledge seeking; it does not cover that area completely. It is against this backdrop that a second theory will be introduced to cover the loophole in TAM as it relates to this study.

## **Method**

Descriptive survey research design was used for this study. The population of the study comprised all the 172 visually impaired students in the five Federal universities in South-East Nigeria. Data was obtained from the University libraries as regards the number of enrolled visually

impaired students across the five Federal universities in South-East. The entire population of 172 visually impaired students in the five Federal Universities in South-East, Nigeria was used as sample for this study. Census study was conducted and there is no sampling for the study since the population is of a manageable number. Data for this study was collected using structured questionnaire. The questionnaire covered three clusters A, B and C

Cluster A measures the available AI information tools with a dichotomous response option of Available (A) and Not Available (N/AV). Cluster B examines the accessibility of AI information tools, also with a dichotomous scale of Accessible (AC) and Not Accessible (N/AC). Cluster C focuses on the knowledge-seeking behaviour of visually impaired students through a 10-item 4-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD), assigned nominal values of 4, 3, 2, and 1 respectively.

The face and content validity of the research instrument was established through expert judgment. The questionnaire was pilot-tested on 10 visually impaired students of Delta State University, Abraka. The Cronbach's Alpha method was used to determine the internal consistency of the questionnaire items and the reliability coefficient of 0.86, 0.70 and 0.74 were obtained for clusters A, B and C respectively

The researcher employed the services of three briefed research assistants who assisted in the distribution of questionnaires, coordination of respondents, and retrieval of completed instruments across the selected public universities in South-East Nigeria. Out of 172 copies of visually impaired students that were given copies of the instruments, 170 copies were retrieved. This gives a retrieval rate of 98%.

The data gathered through questionnaire were analyzed using descriptive statistics of frequency counts, percentages, mean and standard deviation. Cluster A uses a dichotomous scale of Available (A) and Not Available (NA) while cluster B had a scale of Accessible (AC) and Not Accessible (N/AC). Percentage scores below 50% was interpreted as Not Available/Not Accessible, while percentage scores above 50% was interpreted as Available/Accessible. Cluster C was analyzed using the 4-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D) and Strongly Disagree (SD) with nominal values 4, 3, 2 and 1 respectively.

## Results

### Research Question 1

What AI information tools are available to visually impaired students in university libraries in South-East Nigeria?

**Table 1: Respondents' ratings on AI information tools are available to visually impaired students in university libraries in South-East Nigeria (N = 140)**

| S/N | Item Statement                                                                                | Available | Not Available |
|-----|-----------------------------------------------------------------------------------------------|-----------|---------------|
|     | Is an AI-powered screen reader available in your university library?                          | ✓         |               |
|     | Is an AI tool for describing images and diagrams available in your university?                |           | ✓             |
|     | Is voice-activated AI assistant available in your university library?                         |           | ✓             |
|     | Is an AI based optical character recognition (OCR) tool available in your university library? | ✓         |               |
|     | Is an AI speech-to-text system available in your library?                                     | ✓         |               |
|     | Is an AI text-to-speech system available in your library?                                     | ✓         |               |
|     | Is an AI object recognition tool available in your university library?                        |           | ✓             |
|     | Is an AI-enhanced Braille translator available in your university library?                    |           | ✓             |
|     | Is an AI tool for personalized learning adaptations available in your university library?     |           | ✓             |

Table 1 reveals AI information tools available to visually impaired students in public university libraries in South-East Nigeria. AI information tools such as AI-powered screen readers, optical character recognition (OCR), speech-to-text, and text-to-speech systems are reported as available. These tools enable students to access and interact with textual information effectively. However, some AI tools are unavailable, including tools for describing images and diagrams, voice-activated assistants, object recognition, AI-enhanced Braille translators, and personalized learning adaptations.

## Research Question 2

What is the level of accessibility of AI information tools for visually impaired students in university libraries in South-East Nigeria?

**Table 2: Respondents' ratings on the level of accessibility of AI information tools for visually impaired students in university libraries in South-East Nigeria (N = 140)**

| S/N | Item Statement                                                                                 | Accessible |      | Not Accessible |    |
|-----|------------------------------------------------------------------------------------------------|------------|------|----------------|----|
|     |                                                                                                | Freq       | %    | Freq           | %  |
| 1   | Is an AI-powered screen reader accessible in your university library?                          | 89         | 63.6 | 51             | 36 |
| 2   | Is an AI based optical character recognition (OCR) tool accessible in your university library? | 49         | 35   | 91             | 65 |

|   |                                                            |    |    |    |    |
|---|------------------------------------------------------------|----|----|----|----|
| 3 | Is an AI speech-to-text system accessible in your library? | 74 | 53 | 66 | 47 |
| 4 | Is an AI text-to-speech system accessible in your library? | 91 | 65 | 49 | 35 |

The results presented in Table 2 show the level of accessibility of AI information tools for visually impaired students in university libraries in South-East Nigeria. The findings indicate that AI-powered screen readers are relatively accessible, as 89 respondents representing 63.6% affirmed their accessibility, while 51 respondents (36%) indicated otherwise. Similarly, AI text-to-speech systems were reported accessible by 91 respondents (65%), whereas 49 respondents (35%) considered them not accessible. AI speech-to-text systems also recorded moderate accessibility, with 74 respondents (53%) affirming accessibility and 66 respondents (47%) indicating non-accessibility. However, AI-based Optical Character Recognition (OCR) tools were largely inaccessible, as only 49 respondents (42%) reported accessibility, while the majority, 81 respondents (58%), indicated that the tools were not accessible.

### Research Question 3

What knowledge-seeking behaviours do visually impaired students exhibit towards meeting AI needs in university libraries in South-East, Nigeria?

**Table 3: Respondents' ratings on knowledge-seeking behaviours do visually impaired students exhibit towards meeting AI needs in university libraries in South-East, Nigeria**

| S/N                 | Knowledge Seeking Behaviour of visually impaired students                                                                    | X           | SD   | Remarks        |
|---------------------|------------------------------------------------------------------------------------------------------------------------------|-------------|------|----------------|
| 1                   | Independently locate, access and utilize academic resources                                                                  | 2.41        | 0.83 | Disagree       |
| 2                   | Use of Assistive Technologies such as screen reader, text-to-speech software, Braille display, audio books and talking books | 3.22        | 0.61 | Agree          |
| 3                   | Use of voice command                                                                                                         | 3.11        | 0.74 | Agree          |
| 4                   | Through Optical Character recognition (OCR) tools to read printed materials.                                                 | 2.68        | 0.79 | Agree          |
| 5                   | Seeking human assistance such as librarian and library guides trained to support them.                                       | 3.61        | 0.55 | Strongly Agree |
| 6                   | Engaging with peer support group.                                                                                            | 3.44        | 0.63 | Agree          |
| 7                   | Depending on personal digital devices with better accessibility features.                                                    | 3.28        | 0.70 | Agree          |
| 8                   | Collaborative information seeking: asking classmate to help search for materials.                                            | 3.36        | 0.66 | Agree          |
| 9                   | Physical navigation in the library using white cane or mobility aids                                                         | 3.73        | 0.49 | Strongly agree |
| 10                  | Relying on AI powered tools such as (Google Assistant, ChatGPT) for quick information retriever.                             | 3.05        | 0.77 | Agree          |
| <b>Cluster Mean</b> |                                                                                                                              | <b>3.19</b> |      | <b>Agree</b>   |

Table 3 presents the mean and standard deviation ratings of respondents on the knowledge-seeking behaviours of visually impaired students towards meeting their artificial intelligence information needs in university libraries in South-East Nigeria. High mean scores for seeking help from librarians ( $\bar{X} = 3.61$ ) and using mobility aids ( $\bar{X} = 3.73$ ) indicate strong reliance on non-digital support. Assistive technologies such as screen readers and text-to-speech tools are moderately used, while peer collaboration and personal devices also support information access. However,

independent information seeking recorded a low mean ( $\bar{X} = 2.41$ ), showing limited autonomy. The cluster mean of 3.19 indicates that, on average, visually impaired students in university libraries in South-East Nigeria agree that they exhibit various knowledge-seeking behaviours in accessing AI information needs in university libraries in South-East, Nigeria. The standard deviation values, ranging from 0.49 to 0.83, indicate that respondents' views were relatively close, showing consistency in responses across the sampled population.

### **Thematic analysis on knowledge-seeking behaviours do visually impaired students exhibit towards meeting AI needs in university libraries**

The thematic analysis of interview responses on knowledge-seeking behaviour of visually impaired students in university libraries in South-East Nigeria revealed patterns in how participants access AI-related information. The data were transcribed, read repeatedly, and coded to identify meaningful statements related to library use frequency, access modes, search strategies, and help-seeking behaviour. The findings show that most students do not frequently visit the library specifically for AI information, as they often rely more on online platforms and personal digital devices. Physical library visits are still common but are usually supported by assistance from others. Many participants reported difficulty navigating digital library platforms due to accessibility barriers, although assistive technologies such as screen readers and voice-enabled tools are commonly used for searching information. It was also found that students adopt mixed strategies, including catalog searches and databases, but often depend on librarians, peers, or classmates for support when searching for AI-related materials.

### **Discussion of Findings**

The findings indicate that only a limited range of AI tools is available in university libraries, with screen readers, OCR systems, speech-to-text, and text-to-speech tools being the most commonly reported. These tools represent the basic layer of accessibility infrastructure currently supporting visually impaired students. This aligns with Kiambati (2021), who found that screen readers and speech-to-text tools were among the key assistive technologies required and available in some Kenyan university libraries, though still insufficient for full accessibility. Similarly, Osadebe, Onuigbo and Ewa (2019) observed that Nigerian university libraries provide general digital services such as online searching and electronic access, but still struggle with the full integration of specialized assistive technologies. This supports the present finding that availability exists, but it is uneven and largely limited to foundational tools. However, Phukubje and Ngoepe (2017) emphasized that many libraries still lack adequate AI-driven assistive technologies despite increasing demand, which further strengthens the present study's position that availability is not yet comprehensive in South-East Nigeria.

The results revealed that while some AI tools such as screen readers and text-to-speech systems are relatively accessible, others like OCR tools show lower accessibility levels, indicating inconsistency in usability across university libraries in South-East Nigeria. This uneven

accessibility pattern reflects deeper infrastructural and support challenges within library systems. In support of this, Osman and Kwafoa (2020) reported that although assistive technologies exist in Ghanaian university libraries, poor funding, low awareness, and weak technical support significantly limit their accessibility to visually impaired users. Similarly, Horsfall and Opara (2023) found that Nigerian university libraries often lack adequate infrastructure and skilled personnel to support inclusive access, which directly affects how effectively visually impaired students can use available resources. These findings align closely with the present study and suggest that accessibility is not only about availability but also about usability, training, and institutional readiness.

The findings show that visually impaired students combine assistive technologies, peer collaboration, and human support in their information-seeking behaviour. Rather than relying solely on independent digital navigation, they adopt blended strategies that include screen readers, assistance from librarians, and peer support. This reflects a transitional stage of digital independence. This is consistent with Aladeniyi, Owokole and Zamani (2024), who found that visually impaired students frequently depend on Braille resources and human assistance due to limited access to digital tools. Similarly, Arowosaye (2022) reported that visually impaired students rely heavily on lecturers, peers, and librarians, particularly when digital systems are not fully accessible or stable. However, Adeyalo and Ogunniyi (2020) observed that university students generally prefer internet-based resources and independent searching, which contrasts with the present finding and highlights the additional barriers faced by visually impaired students.

## Conclusion

This study concluded that visually impaired students in university libraries in South-East Nigeria have basic AI tools such as screen readers, text-to-speech, speech-to-text, and OCR systems are available, their presence is limited, uneven, and insufficient to fully meet students' needs, while more advanced AI solutions remain largely unavailable. Accessibility also varies significantly between federal and state universities, indicating inequality in infrastructure and support systems. The study further concluded that visually impaired students rely on a combination of assistive technologies, human support, and peer collaboration due to system limitations, while their knowledge-seeking behaviour remains similar across institutions.

## Recommendations

Based on the findings, the following recommendations were made:

1. University libraries in South-East Nigeria, in collaboration with university management and relevant government agencies, should prioritize the provision of a wider range of AI tools that promote independent learning. This includes

investing in advanced solutions such as AI-powered image and diagram describers, real-time text summarization, personalized learning adaptation systems, computer vision for object recognition, and enhanced Braille translators.

2. Library authorities in South-East Nigeria should expand the current limited stock of AI tools beyond basic screen readers, OCR, speech-to-text, and text-to-speech systems. Management should allocate dedicated funding for the acquisition and regular upgrading of modern AI assistive technologies.
3. Libraries should strengthen hybrid support systems by training librarians and introducing peer-mentorship programs specifically for visually impaired students. Orientation sessions on effective integration of assistive technologies with human support should be made mandatory.

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