

Adoption of ICT Tools for Interaction and Services Provision for People with Special Need Users by the Libraries of Abdullahi Muhammed Public Library, Ahmadu Bello University and Kaduna State Public Library Kofan Doka Zaria

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Abstract

This study examines the “*Adoption of ICT Tools for interaction and Services Provision for People with special need Users by the Libraries of Abdullahi Muhammed Public Library, Ahmadu Bello University and Kaduna State Public Library Kofan Doka zaria*” in conducting the study two research questions were formulated, *What are the types of ICT tools available for user’s interaction with people with special need by the staff of Abdullahi Muhammed public library, Ahmadu Bello University, Zaria, What are the challenges staff encountered with use of ICT tools for users interaction with people with special need by the Staff of Abdullahi Muhammad public library, Ahmadu Bello University, Zaria. The methodology adopted for the study was quantitative research method with a survey research design. The target population of the study comprises of forty three (43) respondents, from Abdullahi Mohammed Public Library Ahmadu Bello University Zaria and Kaduna State Public Library Kofan Doka Zaria were used as a sample of the study, a structured questionnaire was used for data collection. The data used to answer the research question was analyzed using frequency and percentage at 50% benchmark for acceptances. The findings show the study found that computer system, alternative input devices, accessible web and mobile applications, the findings show the study found that insufficient fund and inadequate support, resources, resistance to technology adoption, limited user understanding of technology, lack of training, knowledge and Insufficient customization of ICT Tools main challenges staff encountered with use of ICT tools. The study concluded that in light of the study it shows that ICTs are vital for enabling effective interaction with people with special need, offering tailored solutions that address a wide range of needs, from assistive devices to inclusive telecommunication technologies,*

voice assistants, assistive technologies and symbol-Based communication boards to be inclusion, the study recommended that the management of should provide more telecommunication Technologies, voice assistants, assistive technologies and symbol-Based communication Boards, speech recognition software, among others. The management of should improve on lack of user feedback integration, usability, among others.

Keywords: Adoption, ICT Tools, Users, Services, Special need and Public Library

Introduction

The integration of Information and communication technologies (ICT) into public libraries has significantly transformed how services are delivered to users, particularly individuals with disabilities. ICT tools enhance the ability of library staff to communicate effectively, provide equitable access to resources, and support the inclusion of all users regardless of their physical or cognitive limitations for free example, text-to-speech tools can read digital content aloud for visually impaired users, while video relay services facilitate communication with deaf patrons through sign language interpreters. Furthermore, staff training in ICT tools is crucial to maximize their potential. Public libraries that invest in up skilling their workforce in the use of accessible ICT are better positioned to serve diverse user populations. This fosters a more inclusive environment where people with disabilities can independently access information and engage in lifelong learning.

According to studies, the adoption of ICT tools in library settings not only improves user satisfaction but also enhances the professional confidence of library staff when interacting with users with special needs (Mutshewa & Mupotsa, 2020). ICT, when appropriately deployed, serves as a powerful enabler of digital inclusion and social equity in public information services. According to IFLA (2011) and Kelechi O. (2020), the educational services that offer a range of resources and services to assist educators at all levels as well as information acquisition, processing, organization, and dissemination for free to all citizens are examples of public library services. They also provide information on politics and governance. As a public service which is open to everybody, the public library has a key role in collecting, organizing and disseminating information, as well as providing access to a wide range of information sources.

Statement of problems

Most people do not realize the fact that public libraries are established to support and re-enforce users interaction and services for people with special need, children, adults and functional education, and the general users, they also promote and stimulate reading for pleasure and recreation for people with special need etc. Infarct people are of diverse opinions, some are very much interested in reading, while others are politically conscious to have the latest information about politics, and others are very much concerned about agricultural information for them to improve their farming activities, and educational activities, especially research projects, theses and dissertations, the West African examination council (WAEC), National Examination Council of Nigeria (NECO) etc. At present, there are some existing public libraries in these areas i.e., Abdullahi Muhammed Public Library and Kaduna State Public Library Doka Zaria are equally available in the areas within the Sabon Gari Local Government and Zaria local government. Therefore, the researcher intends to affirm these assertions by studying the adoption of ICT Tools for user's interaction and Services for people with special need by the Staff of Abdullahi Muhammed Public Library, Ahmadu Bello University and Kaduna state public Library Kofan Doka Zaria.

Research question

1. What are the types of ICT tools available for user's interaction with people with special need by the staff of Abdullahi Muhammed public library, Ahmadu Bello University, Zaria and Kaduna state public Library Kofan Doka Zaria?
2. What are the challenges staff encountered with the use of ICT tools for users interaction with special need by the staff of Abdullahi Muhammad public library, Ahmadu Bello University, Zaria and Kaduna state public Library Kofan Doka Zaria?

Literature review

Types of Information and communication technologies (ICTs) for library staff to interact with people with special need which have significantly enhanced accessibility and social inclusion for individuals with disabilities, these technologies provide various tools and platforms that enable easier communication, learning, working, and participation in daily life. The following are key types of ICT designed or adapted to facilitate interaction with people who have disabilities: Assistive technologies (AT): Assistive technologies are specialized devices or software used to enhance the functional capabilities of individuals with disabilities, Screen readers: Used by individuals who are blind or visually impaired (e.g., Jaws, Nvda). Assistive products can range from physical products such as wheelchairs, glasses, prosthetic limbs, white canes, and hearing aids to digital solutions such as speech recognition or time management software and captioning, most people who use assistive technology use more than one product, making integrated services Important. Globally, more than 2.5 billion people need one or more assistive products, with an ageing global population and a rise in non-communicable diseases, an estimated 3.5 billion people will need assistive technology by 2050.

Assistive products help maintain or improve an individual's functioning related to cognition, communication, hearing, mobility, self-care and vision, thus enabling their health, well-being, inclusion and participation. Improving access to assistive technology can contribute to the achievement of the sustainable development goals and to ensuring that no one is left behind. This is through enabling the inclusion and participation of assistive technology users in their family, community and all areas of society, including the political, economic and social spheres.

According to World health organization WHO, (2021), Speech recognition software: Helps individuals with mobility impairments control computers using their voice (e.g, Dragon Naturallyspeaking), Speech recognition software refers to computer programs or systems that can identify and process human speech into text or commands, Originally developed for accessibility and dictation purposes, speech recognition technology has rapidly advanced, Apple's siri, google assistant, amazon alexa, and microsoft cortana. It is also used in industries such as healthcare for medical transcription, in customer service for automated phone systems, and in automotive systems for hands-free navigation and control. Modern speech recognition systems are trained using large datasets of voice samples and can adapt to various accents, dialects, and noisy environments. They often include features like voice biometrics for security, real-time transcription, and multi-language support. Alternative input devices: Include switches, head pointers, and eye-tracking systems for those unable to use standard keyboards and mice. Assistive technology enables and promotes inclusion and participation, especially of persons with disability, aging populations, and people with non-communicable diseases. The primary purpose of assistive

products is to maintain or improve an individual's functioning and independence, thereby promoting their well-being. They enable people to live healthy, productive, independent and dignified lives, and to participate in education, the labour market and civic life. Examples of assistive products include hearing aids, wheelchairs, spectacles, prostheses and devices that support memory, among many others. Despite the global need and recognized benefits of assistive products, access to assistive products remains limited. Addressing this unmet need is essential to progress towards the achievement of the sustainable development goals and realizing the convention of the rights of persons with disabilities (WHO, 2021).

Augmentative and Alternative Communication (AAC) Devices: Augmentative and alternative communication (AAC) devices are tools and technologies designed to support or replace verbal speech for individuals with communication impairments. These tools empower users by giving them a voice, facilitating social interaction, education, employment, and increased independence. Symbol-based communication boards are a type of augmentative and alternative communication (AAC) tool used to support individuals who have limited or no ability to speak. These boards display a collection of images, symbols, or icons that represent words, phrases, or concepts. Users point to or select symbols to express their needs, thoughts, and emotions communication boards can be low-tech, such as laminated paper boards with printed symbols (like PECS – Picture exchange communication system), or high-tech, such as dynamic displays on tablets or dedicated speech-generating devices. Symbols used in communication boards may include standardized sets like boardmaker PCS (Picture communication symbols), Widgit Symbols, or SymbolStix. They are often organized in categories such as food, actions, or emotions to make it easier for users to construct sentences and communicate more effectively (Beukelman, D. R., & Light, J. C. (2020). Speech-generating devices (SGDs) speech-generating devices (SGDs), also known as voice output communication aids (VOCAs), are electronic systems designed to assist individuals who have severe speech impairments. These devices produce spoken language, allowing users to communicate with others when natural speech is limited or absent.

SGDs are a subset of high-tech Augmentative and Alternative Communication (AAC) tools. They convert text or symbols into synthesized or recorded speech, helping individuals with conditions such as cerebral palsy, autism spectrum disorder, amyotrophic lateral sclerosis (ALS), traumatic brain injuries, or stroke-related aphasia. Users input messages via touchscreens, keyboards, eye-tracking systems, or switch-access interfaces, depending on their physical abilities. Modern SGDs vary widely in design—from dedicated hardware devices to software applications installed on tablets and smartphones. Many now include features like predictive text, customizable vocabularies, multilingual support, and even environmental control integration. These devices not only enhance functional communication but also promote independence, emotional expression, and social inclusion. (*Web content accessibility guidelines, 2018*).

Accessible to web and mobile applications: Websites and mobile apps that follow accessibility guidelines (such as WCAG) allow users with disabilities to navigate, perceive, and interact with digital content. Accessible web and mobile applications accessible web and mobile applications are designed to be usable by individuals of all abilities, including people with disabilities. Accessibility ensures that users with visual, auditory, motor, or cognitive impairments can navigate and interact with digital content effectively and independently. Accessibility not only benefits users with disabilities—it also improves usability for older adults, people in low-bandwidth environments, and users with temporary impairments. Moreover, many countries now have legal requirements

for digital accessibility, such as the Americans with disabilities Act (ADA) in the U.S. and the European Accessibility Act. Text-to-speech and voice control features in smartphones. Text-to-Speech and Voice Control Features, Text-to-speech (TTS) and voice control are two key accessibility and productivity technologies that allow for greater digital inclusion, especially for individuals with disabilities, Text-to-speech (TTS) technology converts written text into spoken audio. It enables users particularly those with visual impairments, dyslexia, or other reading difficulties—to access digital content by listening rather than reading. TTS systems are widely integrated into operating systems, web browsers, and mobile applications, offering multiple voices, languages, and adjustable speech rates.

According to *web content accessibility guidelines* (2018) these features are especially useful in education, navigation, and content consumption.

Voice control, on the other hand, enables users to operate digital devices through spoken commands. This technology is particularly helpful for users with motor impairments, allowing them to perform functions such as opening apps, typing text, navigating menus, or even controlling smart home devices entirely hands-free. Built-in systems like apple's voice control, Google Assistant, amazon alexa, and microsoft cortana provide robust voice interaction platforms. Together, TTS and voice control contribute significantly to creating more inclusive technology ecosystems. They enhance independence, improve user engagement, and expand access to information and services for a wide range of users, customizable display settings, including font size and contrast for users with low vision

Customizable display settings are accessibility features built into digital devices, software, and applications that allow users to adjust how visual information is presented. These settings are essential for accommodating a wide range of users, particularly those with visual impairments, cognitive disabilities, or sensitivity to light and motion. Common customizable display settings include: Text size and font adjustments, contrast and color schemes (e.g., high contrast, dark mode), Zoom and magnification tools, Screen brightness controls, reduced motion or animation options and Customizable layout or spacing to reduce visual clutter

These features support users with conditions such as low vision, dyslexia, color blindness, and photosensitive epilepsy. They are not only crucial for accessibility but also enhance comfort and readability for the general population, including users in bright environments or that experiencing screen fatigue.

Customizable display settings are now standard across operating systems like Windows, macOS, android, and iOS, as well as in many websites and apps that follow the Web Content accessibility guidelines (WCAG) (*Web Content Accessibility Guidelines*, 2018).

Telecommunication technologies: These tools support remote communication, critical for social and professional engagement; **Video relay services (VRS):** Enable deaf users to communicate through sign language interpreters via video calls. **Video relay services (VRS), video relay Services (VRS)** are telecommunications services that enable people who use sign language—primarily individuals who are deaf or hard of hearing—to communicate with voice telephone users in real time via video technology and a sign language interpreter. In a VRS call, the deaf user communicates in **American Sign language (ASL)** (or another signed language) via a video link to a **certified interpreter**, who then translates the signed language into spoken language for the hearing person on the other end of the phone call. The interpreter also relays spoken responses

back into sign language. This real-time, two-way communication allows for more **natural, expressive, and accurate conversations** compared to text-based systems like TTY or relay typing. VRS is particularly important for **equal access to telephone communication**, offering a vital communication bridge in personal, educational, and professional settings. It is funded in many countries (such as the U.S.) through government programs like the **Federal Communications Commission (FCC)** under the **Telecommunications Relay Services (TRS)** system. VRS is typically accessed via dedicated video phones, mobile apps, or computer software. Major providers include **Sorenson, ZVRS, and Convo**, among other (Federal Communications Commission, 2025). **Real-time text (RTT)** and **captioned telephony** services for individuals who are hard of hearing.

Smart Home and IoT Technologies: Smart home systems allow users with physical or cognitive disabilities to control environments independently. *Hersh, M. (2015)*, **Voice assistants** (e.g., Alexa, Google Assistant) to control lighting, thermostats, or appliances and **Wearable technology** to monitor health or provide tactile alerts.

Challenges staff encountered with use of ICT tools for users interact with special need. The use of Information and Communication Technology (ICT) tools has significantly transformed the way services and education is delivered to people with disabilities. However, despite their potential, staffs that interact with these tools and users face several challenges when implementing ICT tools for individuals with disabilities. These challenges can impact the effectiveness of technology and hinder the user experience. Here are some of the key challenges that staff may encounter: **Lack of training and knowledge**, one of the primary challenges staff face when using ICT tools with users who have disabilities is the lack of adequate training. Many staff members are not fully trained in how to use assistive technologies (AT) or other ICT tools effectively, without proper training, staff may struggle to troubleshoot technical issues or understand how to provide personalized assistance based on an individual's specific disability needs. **Challenge:** staff may not be familiar with how different disabilities require different technological solutions (e.g., screen readers for the visually impaired, hearing aids for the hearing impaired) and misunderstanding or lack of knowledge about how to adjust settings for maximum accessibility can lead to ineffective use of ICT tools (Scherer & Demers, 2023). **Insufficient customization of ICT Tools:** another common issue is the lack of customization options in ICT tools. While many ICT solutions come with built-in accessibility features, they may not always be sufficient or flexible enough to meet the diverse needs of users with disabilities. For example, tools may not offer the right voice modulation for users with hearing impairments or may not be customizable enough for users with cognitive disabilities. ICT tools may offer standard features, but they may not provide the flexibility needed to address the specific needs of individual users; staff may lack the resources to modify tools or may not be aware of advanced features that could help (Al-Azawei et al., 2024). **Technological barriers and incompatibility:** ICT tools, especially those used for people with disabilities, are often subject to compatibility issues. For example, software that works well with one operating system or device may not work properly on another. Inconsistent updates across platforms or devices can also result in accessibility features not functioning as intended, which makes it challenging for staff to support users effectively, ICT tools may not be compatible with all devices, which can lead to technical difficulties or disruptions in service for users and staff may be required to troubleshoot issues across various devices or operating systems, which can be

time-consuming and complex (Caldwell et al., 2023). **Resistance to technology adoption:** Some staff may resist adopting ICT tools, especially if they are unfamiliar with the technology or if the technology requires a shift from traditional methods. This resistance can be particularly strong if the tools seem complex or if there is a lack of perceived benefit to using them. **Challenge:** Resistance to new technology can lead to a reluctance to engage with ICT tools, limiting their potential to improve services for people with disabilities and Staff may also feel overwhelmed by the increased workload or responsibility that comes with incorporating new technologies into their routine (Borg et al., 2024). **Inadequate support and Resources:** staff members who work with users with disabilities may not have the necessary support or resources to implement ICT tools successfully. In many settings, especially in educational or healthcare environments, there may be limited access to technical support or to specialists who can offer guidance. Moreover, funding for advanced ICT tools may be inadequate, leaving staff to rely on less effective or outdated technologies.

Lack of technical support or in-house specialists can make it difficult for staff to solve problems quickly or effectively and budget constraints often prevent the acquisition of the most up-to-date tools, which could hinder the ability to provide optimal care (Jha & Gupta, 2023). **Limited user understanding of technology:** sometimes, users with disabilities may also face challenges in understanding how to use ICT tools effectively. This can be due to cognitive limitations, lack of familiarity with technology, or a lack of personalized guidance. Even with assistive technology in place, users may still struggle to navigate the systems without proper training or support. Users may not fully understand how to interact with or adjust ICT tools to suit their needs, leading to frustration or limited engagement and staff may face difficulties in teaching users how to use the tools in a way that makes them effective (Smith et al., 2023). **Privacy and security concerns:** the use of ICT tools to assist people with disabilities often involves the collection and processing of personal and sensitive information. This raises concerns about privacy and data security. Staff may not be fully aware of the best practices for ensuring that user data is protected, and breaches of privacy can undermine trust in the system. **Challenge:** there is a need for clear policies and practices regarding the secure handling of sensitive data related to users with disabilities and staff may not be trained to manage data security risks effectively, leaving users vulnerable (Borg et al., 2024). **Lack of user feedback integration:** ICT tools designed for users with disabilities must be flexible enough to evolve based on user feedback. If feedback is not systematically collected or incorporated into future updates, the tools may not adequately meet the needs of users, leaving staff to manually adapt or work around limitations. (Al-Azawei, A., et al, 2024). Staff may not have a clear process for collecting user feedback on ICT tool effectiveness, leading to a lack of continuous improvement: Tools may become obsolete or inefficient over time without regular updates based on real-world feedback (Scherer & Demers, 2023).

Methodology

The research methodology adopted was Quantitative research because is more concerned with systematic empirical investigation of social observable phenomena via statistical, mathematical, or computational techniques. A cross-sectional survey research design was adopted for the study. The population of this study constitutes thirteen (13) Staff of Abdullahi Mohammed Public Library Ahmadu Bello University Zaria and thirty (30) Staff of Kaduna State Public Library Kofan Doka were used as a sample of the study, a structured questionnaire was used for data

collection. The data used to answer the research question was analyzed using frequency and percentage at 50% benchmark for acceptances

Table 1 Types of ICT Tools available Interaction by People with special need of Abdullahi Muhammad Public Library, Ahmadu Bello University, Zaria, and Kaduna State Public Library Kofan Doka, Zaria

| S/N | Types of ICT Tools available Interaction by People with special need | Category of respondents | | F | Percentage |
|-----|--|--|--|----|------------|
| | | Abdullahi Muhammad public library ABU, Zaria | Kaduna state public Library Kofan Doka Zaria | | |
| 1 | Assistive technologies | 5(38.4) | 10(33.3) | 15 | 34.8% |
| 2 | Screen readers | 3(23.0) | 6(20) | 9 | 20.9% |
| 3 | Speech recognition software | 7(53.8) | 5(16.6) | 12 | 27.9% |
| 4 | Augmentative and alternative Communication (AAC) devices | 2(15.3) | 6(20) | 10 | 23.2% |
| 5 | Computer system | 10(76.9) | 20(66.6) | 30 | 69.7% |
| 6 | Alternative input devices | 11(48.6) | 15(50) | 26 | 60.4% |
| 7 | Smart home and Iot technologies | 1(7.6) | 4(13.3) | 5 | 11.6% |
| 8 | Wearable technology | 4(30.7) | 7(23.3) | 11 | 25.5% |
| 9 | Symbol-Based communication boards | 7(53.8) | 8(26.6) | 15 | 34.8% |
| 10 | Accessible web and mobile applications | 9(6.9) | 17(56.6) | 26 | 60.4% |
| 11 | Telecommunication technologies | 8(61.5) | 12(40) | 20 | 46.5% |
| 12 | Voice assistants | 6(46.1) | 11(36.6) | 17 | 39.5% |

Source: public libraries management 2025

Table.1 revealed that, computer system with 30(69.7%) had the highest percentage on the types of ICT Tools available Interaction by People with special need by the staff of Abdullahi Muhammad public library, Ahmadu Bello University, Zaria, and Kaduna state public Library Kofan Doka, Zaria, followed by alternative input devices and accessible web and mobile applications with 26(60.4%) each. while, telecommunication technologies with 20(46.5%), followed by voice assistants with 17(39.5%). Then, assistive technologies and symbol-Based communication boards with 15(34.8%), Followed by speech recognition software with 12 (27.9%), followed by wearable technology with 11(25.5%). Then, augmentative and alternative communication (AAC) devices with 10 (23.2%), followed by, screen readers 9(20.9%), followed by smart home and IOT technologies with 5(11.6%)

Table.2 Challenges Staff encountered with Use of ICT Tools for Users Interaction with People with special Need by the Staff of Abdullahi Muhammad Public Library, Ahmadu Bello University, Zaria and Kaduna State Public Library Kofan Doka Zaria City.

| S/N | Challenges Staff encountered with Use of ICT Tools for Users Interaction with People with special need | Category of respondents | | F | Percentage |
|-----|--|--|--|----|------------|
| | | Abdullahi Muhammad public library ABU, Zaria | Kaduna state public Library Kofan Doka | | |
| 1 | Insufficient fund | 9(6.9) | 21(20) | 30 | 69.7% |

| | | | | | |
|----|--|----------|----------|----|-------|
| 2 | Lack of user feedback integration | 7(53.8) | 13(26.6) | 20 | 46.5% |
| 3 | Limited user understanding of Technology | 5(38.4) | 19(63.3) | 24 | 55.8% |
| 4 | Usability and ease of use | 3(23.0) | 9(30) | 12 | 27% |
| 5 | Inadequate support and Resources | 11(84.6) | 19(63) | 30 | 69.7% |
| 6 | Resistance to Technology adoption | 7(53.8) | 18(60) | 25 | 58.1% |
| 7 | Privacy and Security concerns | 3(23.0) | 4(13.3) | 7 | 16.2% |
| 8 | Technological barriers and incompatibility | 2(15.3) | 7(23.3) | 9 | 20.9% |
| 9 | Lack of training and knowledge | 11(84.6) | 12(40) | 23 | 53.4% |
| 10 | Insufficient customization of ICT Tools | 9(6.9) | 13(26.6) | 22 | 51.1% |

Source: Public Library Management 2025

Table.3 Revealed that, insufficient fund and inadequate support and resources with 30(39.7%) each had the highest percentage on the challenges staff encountered with use of ICT tools for users interaction with people with special need by the staff of Abdullahi Muhammad public library, Ahmadu Bello University, Zaria and Kaduna State public Library Kofan Doka, followed by resistance to technology adoption with 25(58.1), limited user understanding of technology with 24(55.8), followed by lack of training and knowledge with 23(53.4), followed by insufficient customization of ICT tools with 22(51.1%), while, lack of user Feedback integration with 20(46.5%), then, usability and ease of use with 12(27.9%), followed by technological barriers and incompatibility with 9(20.9%), followed by privacy and security concerns with 7(16.2%).

Summary of Findings

The findings for this research study are

1. Computer system, alternative input devices and accessible web and mobile applications as the main types of ICT tools available for user's interaction with people with special need by the staff of Abdullahi Muhammad public library, Ahmadu Bello University, Zaria, and Kaduna state public Library Kofan Doka, Zaria.
2. Insufficient fund and inadequate support and resources, resistance to technology adoption, limited user understanding of technology, lack of training and knowledge and insufficient customization of ICT Tools main challenges staff encountered with use of ICT tools for users interaction with people with special need by the staff of Abdullahi Muhammad public library, Ahmadu Bello University, Zaria and Kaduna state public Library Kofan Doka Zaria.

Conclusion

In light of the study it shows that ICTs are vital for enabling effective interaction with people with special need, offering tailored solutions that address a wide range of needs, from assistive devices to inclusive telecommunication technologies, voice assistants, assistive technologies and symbol-Based communication boards to be inclusion.

Recommendation

Based on the findings of this Study, the following recommendations are made:

1. The management of should provide more telecommunication technologies, voice assistants, assistive technologies and symbol-Based communication boards, speech recognition software, wearable technology, augmentative and alternative communication (AAC), screen readers and smart home and IOT technologies.
2. The management of should provide solution to lack of user feedback integration, usability and ease of use, technological barriers, incompatibility and privacy and security concerns.

Reference:

- Al-Azawei, A., et al. (2024) Challenges in the use of assistive technology for students with disabilities. *Journal of Special Education Technology*, 29(3), 134-148.
- Beukelman, D. R., & Light, J. C. (2020). *Augmentative and alternative communication: supporting children and adults with complex communication needs* (5th ed.). Paul H. Brooks publishing Co
- Borg, J., et al. (2024) technological challenges and strategies in supporting students with disabilities. *Disability and Rehabilitation: Assistive Technology*, 19(1), 72-85.
- Caldwell, P., et al. (2023). The impact of technology on accessibility: Barriers and solutions for inclusive education. *Educational Technology research and development*, 71(2), 225-240.
- Hersh, M. (2015). "Overcoming barriers to technology use in the home: smart home technologies for older people and people with disabilities." *Journal of Smart Home Technologies*.
- Jha, S., & Gupta, P. (2023). Barriers to the implementation of assistive technology in classrooms for students with disabilities. *International Journal of inclusive education*, 27(4), 487-500.
- Mutshewa, A., & Mupotsa, D. (2020). ICT Accessibility and Library Services for Persons with disabilities in public libraries. *Journal of librarianship and information science*, 52(3), 457-470. <https://doi.org/10.1177/0961000619882183>
- Scherer, M. J., & Demers, L. (2023). Assistive technology and user satisfaction: Challenges and strategies. *Journal of rehabilitation research and development*, 54(6), 740-752.
- Smith, R., et al. (2023). Understanding user satisfaction with assistive technology in education. *Journal of special education technology*, 29(2), 98-112
- W3C. (2023) Guidelines for measuring accessibility and satisfaction in digital tools. Retrieved from <https://www.w3.org/WAI/WCAG21>

W3C. (2018). *web content accessibility guidelines (WCAG) 2.1*. world wide web consortium.
<https://www.w3.org/TR/WCAG21/>

World Health Organization (WHO, 2021). "Assistive technology." <https://www.who.int/news-room/fact-sheets/detail/assistive-technology>.