



CHALLENGES IN USING ASSISTIVE TECHNOLOGIES FOR INFORMATION ACCESS BY THE SPECIAL NEEDS STUDENTS

ABUBAKAR SADIQ ABDULLAHI

Bayero University Library,
P.M.B. 3011, Kano, Kano State, Nigeria.
asabdullahi.lib@buk.edu.ng

&

SAMIRA ABUBAKAR

The Library, Yusuf Maitama Sule University, Kano,
Kano State, Nigeria.
samiraabubakar87@yahoo.com

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ABSTRACT

This paper provides a review on challenges to the use of assistive technologies (ATs) for information access by the students with special needs. The study in the introduction part highlight the befitting types of information access ATs especially for the students with visual, hearing and mobility impairments. The precursors to the use of ATs for information access by the students with special needs were also highlighted. The study examine that for almost a decade, that is, from the year 2022 back to 2011 the use of ATs for information access by the students with special needs have been confronting with challenges of unavailability and inaccessibility of adequate ATs, the lack of technology operational knowledge and skills, anxiety and users reluctance to technological training, among others, which are attributed to the government and school authorities lack of commitments towards their technical and administrative responsibilities of providing ATs, AT policy and assistive technology studies curriculum for learning and acquiring the technological use competencies. The study concludes that use of ATs for information access by the students with special needs have not been given the consideration it deserves. The study therefore recommends that those who are shouldered the responsibility should provide the special needs students with appropriate and functional information access ATs, AT use policy, curriculum on AT studies, Minimum Standard or Guideline on teaching and training on the AT operational knowledge and skills, dedicated subject with appropriate lesson period allocation for daily teaching the students the ATs operational knowledge and skills, AT specialist for teaching special needs students the technology operation knowledge (TOK) and technology operation skills (TOS), librarians with proficiency in assistive technology knowledge and skills, among others.

Keywords: Assistive technologies, Information access, Special needs, Students, Challenges

Introduction

From time immemorial, information in whatever form serves as basis for human awareness and knowledge, a tool in the search for solutions to problems that mankind has come to grapple with, and a veritable instrument in the search for knowledge and quest to attain development. In school environment, people especially the students' use information in order to generate ideas, to be inspired, to obtain knowledge for learning, to advances their knowledge, for supplementing their class notes, for doing school and homework, in order to prepare for test, for making plans, reading news and in order to derive pleasure. These and sundry purposes posed the needs for efficient access to information by the students. In utilization context, 'access' is characterized as a factor influencing use, because the extent of efficient access to information denotes extent of effective information utilization and information needs satisfaction.



Special needs students, especially the visually, hearing and mobility impaired ones cannot conventionally access information in the same manner their unimpaired colleagues do, due to partial to total inability to see and observe information; partial to total inability to process oral information as a result of hard of hearing and deafness; and the weakness, pain, limitations of muscular control such as involuntary movements, lack of coordination, limitations of sensation, joint problems or missing limbs as a result of loss of muscular endurance, the paralysis and amputations. The advent of electronic age and breakthrough in modern technologies has brought array of cutting-edge information technologies and ATs for special needs people to use to search and get information. ATs are technologies that are specifically created, developed and adapted or modified in a specific way in order to help people with special needs to overcome challenges, enhances their functional independence and be able to carry out tasks independently.

ATs impacts the ability of special needs people to perform basic life functions such as hearing, seeing and mobility and enhances their functional performance to complete tasks that seems difficult or impossible by them. ATs are available as hardware, software, and web-based resources, and can be computer hardware or software or electronic device (Alabi & Mutula, 2019), including alternative format of information (Alberta, Philip & Duffour, 2020). Information access assistive technologies (IAATs) are the physical and digital technologies specifically created, developed or modified to facilitate information access by the special needs people, including the certain components and the functionalities of some other technologies. Low-IAATs are equipment that are non-electric. High-IAATs are sophisticated mechanical or electronic technologies usually complex and programmable.

IAATs includes items such as computers and/or electronics, the Internet technologies, computers with ease-of-access features, the tactile tools, auditory tools, screen readers software, text reader software, talking browsers, Braille translation software, information enlargement and magnification technologies; sign language videos, sign language to text translator, speech to text translator, information description and instant messaging technologies; head mouse click helper technologies, eye mouse click helper technologies, touch screens, trackballs, head pointers, eye trackers, wands and sticks, speech recognition software for information seekers with visual, hearing and mobility impairments to sensed, listen effectively, see efficiently, navigate, browse, point at and click on information for access.

Basic computer technologies such as hardware which the computer is physically made up of, such as monitor, keyboard and mouse helps in the information access. Monitor/screen is through which almost all information is visually displays and communicating from the computer to the user. Keyboard and mouse are important tools and the two most common ways that users communicate with computer-or tell the computer what they want it to do regarding information access. Keyboard allows a user to communicate with the computer using its keys. Mouse pointer /cursor/ arrow is the visual cue that helps users to points, selects, click and moves information and other things on monitor. CD, flash disk, or external hard drive, helps users to access and copy information files. Internal components allow users to store, receive, retrieve and process information.

Computers ease-of-access accessibility tools provides options for people who have learning, vision, hearing, and mobility impairments to use the 'narrator feature' to



have text information read to them, to use the 'speech recognition feature' to control their computer with voice commands or convert speech to text so that they do not need to type. Activate keyboard and visual features to make navigating their computer easier for information access. Internet technologies such as web browser and web Search engines are very helpful and allow the special needs students to search the Internet to locate and access information. Perceptible, audio and text/image expansion technologies provides students with visual impairments a chance to gain access to information through both auditory and tactile methods, text enlargement and colors enhancement. Description, translations and amplification technologies gives a chance to hearing-impaired to process and access oral information. Sip-and-puff systems are alternative input devices that allows users with mobility impairment to control their computers through means other than a standard keyboard or pointing device. They replace a computer keyboard or mouse and give the mobility-impaired users a chance to control a computer screen, navigate and select in order to access information.

Obviously, the use of assistive technologies seemingly serves as gateway to effective and efficient access to information and undoubtedly opening up huge opportunities to access both print and electronic information. Despite the benefits of ATs for information access, it is however observed that in this era of modern information technology breakthrough, the special needs students are still finding it somehow difficult to access timely information, which could be due to paucity of investigations on what should ideally be done, the commitments towards doing it and the challenges associated with it. This issue posed the need for this study in order to examine the precursors and challenges to the use of ATs for information access.

Precursors to Use of ATs for Information Access by Students

A study by Marshall (2007) on a model for explaining technology usage, proposes a Quadratic (four equal parts) Usage Model and found that, actual usage of technology comprise of four factors: technical, philosophical, external and the internal factor. Technical factors include the technology and competency, which determine the ability to use technology. Philosophical factors include the cultural and personal values, which determine the motivation to use technology. External factor include technology and the cultural values. Internal factors comprise of user competency and personal values. First, the model emphasized that real usage requires both ability and motivation. Second, all four factors must cooperate at some level for usage to occur. Technical factors are required for the ability to use and philosophical factors are required for motivation. Third, each quadrant has a number of elements which combine in a dynamic fashion. Each factor is seen as a complex (multipart) set of elements, which are in flux over time.

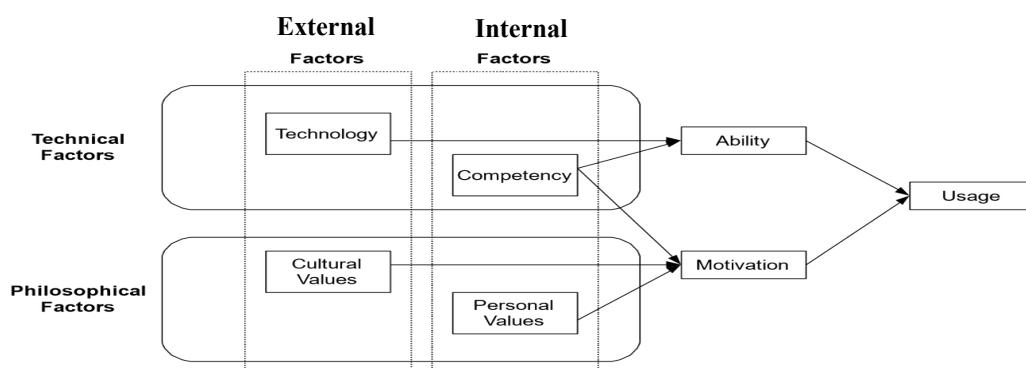


Figure 1: Quadratic Usage Model (QUM)



A study by Dominic, Joshua and Eytayo (2020) in a study found that the provision, availability, and adequacy, that is, sufficiency in terms of quantity and quality among factors predisposing the effective and efficient usage of ATs by the students. In Ghana, a study by Nyavor and Amaniampong (2020) also found that the provision and availability of technologies, amongst the factors that facilitate the use of ATs in National Inclusive Basic School. Another study by Abbas *et al.* (2018) found the task technology fits as factor influences users' use of information technology. On the one hand, a study by Nyavor and Amaniampong (2020) found the 'knowledge' of using technologies as other factor predisposing usage of ATs of which technological knowledge is an element of competency. A study by Al-Ruz and Khasawneh (2011) found 'technology skills' of which the technological skill is also an element of competency, self-confidence about technology use, and technology self-efficacy among factors facilitating technology usage.

Jamali-Phiri *et al.* (2021) conducted a study in Malawi and found factors influencing the use of ATs among children with disabilities include the atmosphere surrounding the user. Such atmosphere could be substantiated to comprise the 'external motivation' and 'user attitudes'. Huang and Yao (2020) conducted a study in Taiwan and found the users' attitude toward usage and subjective norms as having a significant impact on behavioral intention to use technologies. In their study on the rational behavior of users, Xia and Zhao (2019) conveyed that perceived usefulness and perceived ease of use of technology are two important aspects that affect users' attitudes towards use. Including self-confidence about technology use, and technology self-efficacy (Al-Ruz & Khasawneh, 2011). It could therefore be substantiated that the availability of ATs in the required ratio, accessibility to ATs, appropriateness of ATs to information access tasks alongside nature of users' impairments, and their competencies in the use of technologies predisposes effective and efficient usage of ATs/IT by the people with special needs.

Availability and accessibility of appropriate ATs hinges on its provision by whom it is responsible for. ATs competencies is to be acquired/developed. Kumar (2013) emphasized that competencies in AT are an important concern for children with impairments and which should be one of key components of compulsory extended core curriculum. A study by Bunney, Sharplin and Howitt (2015) found that competencies development requires and can be best achieved through scaffolding teaching, learning tasks, regular practice and feedback. Chan, Fong, Luk and Ho (2017) opined that in order to assist and encourage students in acquiring and developing competencies, it is essential to have well balanced and structured competencies learning tasks throughout a course, because, in practice, when planning a curriculum, the nature of competencies must be taken into consideration (Chan, Fong, Luk & Ho, 2017). The Commission on Science and Technology for Development (2018) noted that education policies should emphasize the importance of providing technological training to students, and programs and curricula should adjust and allow for flexibility so as to continuously adapt to the changing technological landscape.

It can be substantiated from the foregoing that the precursors of ATs use for information access is associated with ATs factor, competencies factor, and the bureaucratic factor. ATs and competencies are the technical factors that are required for the usage capabilities. Bureaucratic factors are required for the technical and administrative supports to the technical factors, all towards effective ATs usage and



information access. Each factor has a number of mainstay associated elements complementarily.

Assistive Technology Factor: Information access is a process that involves access tools. ATs serves as tools and gateway to effective and efficient access to information. These technologies should be adequately provided and available in a required quantity, functional, accessible to the users, appropriate to the information access tasks and users nature of impairments.

Competencies Factor: In a practical utilization context, and in order to make full use of the information access ATs, the special needs students requires more than just the availability and accessibility to appropriate information access ATs, they also needs 'technological competencies' which is the blends together of inseparably requisite knowledge about the ATs itself, the ATs operational knowledge, the practical skills of using the ATs interactively and the users attitudinal mindset toward technology. It must therefore be recognized that the special needs students should first be taught to understand about the ATs itself, the steps on how to operate the ATs and be trained about the ATs hands-on operational skills through orchestrated education and practices. Acquiring/developing ATs competencies of special needs students are educational policies and curriculum matters comprising the scaffolding teaching through classroom lessons, learning tasks, technological training through mentoring in one-on-one sessions with experts in the technology laboratory, retraining, regular practice and the technical and administrative supports in school.

Bureaucratic Factor: In school environment, things are done according to formal processes and ordering of necessary strategies and series of actions. In school therefore, the provision of ATs and competencies learning and training strategies are the bureaucratic technical and administrative responsibilities of government and school authorities. It is the official responsibility of these authorities to provide and made available, accessible and in a required quantity the appropriate information access ATs. It is also their responsibility to design and provide AT use policy, National Curriculum on AT Studies, Minimum Standard or Guideline on teaching and training on the AT operational knowledge and skills, dedicated subject with appropriate lesson period allocation for daily teaching the students the ATs operational knowledge and skills, ATs Proficiency Assessment Framework, AT specialist for teaching special needs students the technology operation knowledge (TOK) and technology operation skills (TOS), librarians with proficiency in AT knowledge and skills, dedicated AT support unit. These elements greatly facilitate ATs accessibility, ATs competencies development and usage.

Usage: This is the actual usage of ATs which is a situation surrounded by the 'bureaucratic motivation' and 'user moods'. Mood felt by the users such as positive and hostile mood about technology fits and accessibility, strategies and series of actions for gaining technological knowledge and skills greatly determine the actual usage. It also includes the perception of ATs users about its ease of use and usefulness to their information access tasks, and self-efficacy beliefs on their capabilities and level of expertise in the ATs usage.



Factors Affecting Use of ATs for Information Access by Special Needs Students

A study by Samwel (2017) on the accessibility of library information resources to the users with Special Needs in Tanzania found that people with special needs faces a lot of obstacles in accessing and using both electronic and physical information resources to support learning. On the challenges, a study conducted by Babusa and Abdullahi (2022) conducted a study on utilization and availability of AT for special needs students in inclusive schools in Kaduna State Nigeria found the lack of availability of ATs and lack of ATs competencies for the use of ATs. Mansa (2017) conducted a study on provision of ATs to students with impairment in Ghana, the outcome of the study revealed that students finds it difficult to access relevant information for academic work, due to unavailability of ATs in the library. A study by Chukwuemeka and Samaila (2020) found that among the factors limiting the use of assistive devices in special education schools in Nigeria, is inadequacy of assistive devices. Kisanga and Kisanga (2020) conducted a study and found the challenges of access to and use of AT among students is shortage of AT tools.

Weerasinghe *et al.* (2015) conducted a study on barriers in using Assistive Devices, the participants described several barriers in using assistive devices, among which include limited knowledge of using modern technology. In addition, Kisanga and Kisanga (2020) conducted a study on challenges and coping mechanisms of access to AT among students in education institutions in Tanzania, the study has identified lack of knowledge on how to use computer ATs. Also, Hughes *et al.* (2014) investigated the perception of people towards the barriers and opportunities of AT in education using a questionnaire organized around several themes. The study found the lack of knowledge about AT, awareness of its benefits and the inadequate knowledge about using it. In the UAE, Almekhalfi and Tibi (2012) conducted a study and found among others the lack of technological knowledge and skill on the use of AT among people with special needs.

Furthermore, Habibu, Abdullah-Al-Mamun and Clement (2012) conducted a study on difficulties facing in using ICT in educational institutions of Uganda found the major barriers were lack of proper usage skills, among others. Bashir, Abdullahi and Onyemaechi (2021) conducted a study on integrating AT for students with disabilities in universities in Nigeria, the findings revealed challenges that hinder the use of AT by the students with disabilities include: lack of availability of resources, lack of trained instructors and absence of technical assistance, among others. UNESCO (2019) found and reported that factors associated with limited accessibility and use of ATs include limited availability of assistive devices, inadequate financing, lack of experts and technical staffs, lack of assistive technology policy.

A study conducted by Addis, Britton and Davies (2020) on challenges and barriers to the use of AT in Africa found the poor policy implementation. Ahmad (2015) conducted a study on barriers for using AT in the field of education by gathering data from secondary sources. The study found that ineffective policies, limited support from government are the main barriers to using AT devices, among others. Johnson (2011) conducted a study on why is AT underused and found 'reluctance' to use the devices among people with disabilities as one of the barriers, among others. Chaurasia *et al.* (2016) used secondary sources, such as published case studies, to investigate the effect of anxiety on the acceptance and use of ATs and found 'anxiety' as significant



barrier to the use ATs. It can be deduced and substantiated that for almost a decade, that is, from the year 2022 back to 2011 the use of ATs for information access by the students with special needs have been confronting with challenges of unavailability and inaccessibility of ATs and the lack of technology operational knowledge and skills.

Conclusion

This review established classification of precursors to the use of information access assistive technologies (IAATs). The precursors are ATs factor, competencies factor, and the bureaucratic factor. Each factor has a number of mainstay associated elements complementarily. ATs and competencies are the technical factors that are required for the usage capabilities. Bureaucratic factors are required for the technical and administrative supports to the technical factors. The actual usage of IAATs is determine by the technical and bureaucratic factors, including the users' mood which comprise of their perception about ATs ease of use and usefulness to their information access tasks, the self-efficacy beliefs on their capabilities and level of expertise in the ATs usage. The challenges to the use of ATs examined includes: unavailability and inaccessibility of ATs, lack of ATs operational knowledge and skills (competencies), anxiety on the use of ATs by the special needs users, reluctance to training and in the use of ATs, as well as the government and school authorities lack of commitment in their technical and administrative responsibilities of providing the ATs policy, ATs studies curriculum for learning and acquiring the ATs use competencies.

Recommendations

1. Availability and accessibility of appropriate information access ATs is a responsibility hinges on its provision by whom it is responsible for. Government and school authorities should provide the special needs with the adequate, appropriate and functional IAATs per-user ratio. This will enable them the independent and timely access to array of information of their needs and wants like their unimpaired counterpart.
2. Special needs students should be taught and train to know the various components of the IAATs to use, learn and acquire the AT operational knowledge and skills. This should be done through formal education and training as a classroom lessons and practical trainings in the ATs/computer laboratory as the case may be.
3. Government and school authorities should provide AT use policy in schools; the National Curriculum on AT studies; the minimum standard or guideline on teaching students the knowledge of how to operate the AT and the training for skills of practical use of ATs in schools; the proficiency framework that describes the different degree of skill or mastery description of familiarity with and of the ability to operate ATs/computer (basic level, intermediate level, proficient level; allocate maximum days for teaching students the knowledge of how they should operate technologies; allocate time for the lesson period on technology operational knowledge; allocate dedicated sessions for practical training for students to acquire AT/IT operational skills in this school, among others.



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AUTHORS' PROFILES



Abubakar Sadiq Abdullahi is at present a Librarian I at the Bayero University Library, Kano. He had B.A. LIS/History, MLIS and presently a Ph.D. student in the Department of Library and Information Sciences, Bayero University, Kano. His areas of research interest include assistive technologies competencies and use, Information resources development and services for people with special needs, information seeking behavior, competencies development, and application of ICTs in library services. He can be reached at: asabdullahi.lib@buk.edu.ng



Samira Abubakar is currently a Librarian I at the Yusuf Maitama Sule University Library, Kano. She had B.A. LIS, MLIS and presently a Ph.D. student in the Department of Library and Information Sciences, Bayero University, Kano. Her areas of research interest are collection security, information literacy, digital skills and competencies, among others.