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## Adaptive Technology for Supporting Persons with Disability in selected Public Academic Libraries in Ghana

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**Adaptive Technology for Supporting Persons with Disability in selected Public  
Academic Libraries in Ghana**

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## **ABSTRACT**

This study was to examine the barriers to access and availability of adaptive technologies in supporting Persons with Disabilities (PWDs) in public academic libraries in Ghana. The study adopted the qualitative research design. The University of Cape Coast Library and the University of Ghana library were purposively selected and interview guides were used for data collection. A total of 20 respondents were selected and the interviews targeted 16 students with disabilities using the snowball approach, the 2 Librarians, and the 2 heads of the unit in the library that catered students with special needs. The thematic content analysis was used to analyse the data. The study revealed that there is some form of adaptive technologies that aided PWDs to access some services in the library, a special unit dedicated to serving the needs of PWDs, and there were dedicated staff that served their needs. Nonetheless, the adaptive technologies that were needed to access the libraries' built environment, as well as library services, were woefully inadequate to afford the persons with disabilities independent life in the library environment. The study recommends that the Librarians should be consulted in the architectural designs and provision of adaptive technologies such as computers with all the necessary software and ensuring that facilities are in good working condition.

**Keywords:** Adaptive Technology, People with Disability, Academic Library, University of Ghana, University of Cape Coast, Ghana

## **INTRODUCTION**

The World Health Organisation (WHO) estimates that over a billion people; representing about 15% of the world's population have some form of disability (WHO, 2013). Out of this number, roughly 80% live in poor and developing countries (Mensah, 2008). Oye-Lithur, Stickney, and Nathan (2007) estimated that 10% of Ghana's citizens were "Persons with Disabilities" (PWDs.). This large minority group is socially excluded as they are deprived of their basic rights to access information. All citizens should have access to information that permits self-development and active participation in a democratic society (Todaro, 2005). Unfortunately, this important right eludes most PWDs. Consequently, there was a need for global, regional, and national legislative interventions like the United Nations Convention on the Rights of Persons with Disabilities (CRPD), the Americans with Disabilities Act (ADA), the African Charter on Human and People's Rights, and among others that strived to include the rights of PWDs.

Ghana in a bid to uphold the rights of PWDs passed the Disability Act 2006 (Act 715). Section 6 of the Act urges owners or occupiers of public places to provide apt facilities that make it open and available for use by PWDs and also obliges public service providers to ensure that such services are accessible to PWDs. However, national and private information and communication service providers exempt the hearing impaired from public information access, and many newspapers, books, and educative materials are offered in inaccessible format to the blind. (Mensah, 2008).

The Sustainable Development Goal (SDG) 4 that stresses on inclusive and equitable quality education and promotion of lifelong learning opportunity for all is somehow dependent on ensuring inclusive built environments in institutions of higher learning of which the library is part (Tudzi, Bugri & Danso, 2017). However, the built environment presents one of the greatest challenges of providing equal opportunities and full integration of PWDs in Ghana (Mensah, 2008). Information, communication, and adaptive technology according to Friedman and Norman, (2012) can offer PWDs new possibilities to freely live and participate in socio-economic activities yet these technologies are woefully inadequate or missing in the public care system.

## **Statement of the Problem**

Studies show that every individual including PWDs needs information for daily decision-making (Yoon & Kim, 2011; Koulikourdi, 2008) and this is one of the fundamental human rights that permits self-development and active participation in a democratic society (Todaro, 2001). This all-important right eludes most PWDs in Ghana as “national and private information and communication service providers” exempt the hearing impaired from public information access and many newspapers, books, and educative materials are offered in inaccessible format to persons with visual impairments, (Mensah, 2008). Again the SDG goal 4 declares the need to ensure “inclusive and equitable education for all” yet, less than 2% of PWDs in Ghana attain education past the second cycle level (Ghana Statistical Services, 2013; Tudzi, et al., 2017) and even these few number struggle since the “built environment of educational institutions including libraries usually is inaccessible to PWDs” (Ashigbi et al., 2015; Fidzani et al., 2013).

Since the passage of the Ghana Disability Act, 2006 (ACT 715); all public facilities including academic libraries were to be made accessible to PWDs by 2016 yet this has not been achieved as most public academic libraries do not have services for PWDs (Kwafoa, 2016). In the face of the growing trend of disability worldwide of which Ghana is no exception (National Health Policy, 2007; WHO, 2013), libraries in Ghana are possibly excluding large potential users as there is a lack of adaptive technology for disabled persons. Given the above, libraries in Ghana will do well for PWDs if they embrace adaptive technologies.

Looking at the numerous studies that have been discussed so far which focus on library accessibility and resources to PWDs, there is much emphasis on library services for persons with visual impairment, physical barriers in the library built environment, accessibility of online resources, the impact of legislation on library service provision for PWDs but none of these studies look at adaptive technologies and how they can help meet the accessibility needs of PWDs holistically. Literature is almost absent on the availability and use of adaptive technology by PWDs in libraries in Ghana. The thrust of this study is to examine the barriers to access and available adaptive technologies for PWDs in public academic libraries in Ghana.

## **Objectives**

The research objectives are as follows:

1. To examine barriers to access in libraries for the PWDs.
2. To investigate the available adaptive technologies in the libraries for PWDs.

## **LITERATURE REVIEW**

### **Overview of Disability**

“Disability” is an evolving concept and has been viewed differently by different scholars. It has been discussed in some detail by a variety of authors across the world. Harris and Enfield (2003) brought to the fore that the global debate, attitudes, assumptions, and the view of disability are usually grouped into four models; the “Charity Model of Disability”, “Medical or the Individual Model of Disability”, “Social Model of Disability” and “The Rights-based Model of Disability”.

The charity and the medical models of disability are individually centered and see PWDs as victims of their impairment and so attribute disability to the individuals’ physical state that stops them from carrying out their normal activities. The charity model hence believed that PWDs deserved our help, pity, charity, sympathy, and welfare so that they could be catered for (Harris & Enfield, 2003). The medical model conversely saw PWDs as persons with a medical condition that need to be cured. These two models proposed segregating PWDs from the “normal” people by the provision of special services and institutionalization of PWDs in special institutions like special schools, homes, sheltered employment places, and hospitals where an expert like social workers, special education teachers, medical professionals, and therapists can provide special care for these unfortunate individuals as a solution to this problem. Todaro (2005) in support of this model declared that disability is a medical condition that prevented individuals from using part of their body either partially, completely, or with ease to perform the daily task.

The shift from the medical model to the “social model of disability” was as a result of disabled groups and several researchers recognizing that disability is socially defined (WHO, 2011; Joint, 2005). People are disabled by barriers in society instead of by their bodies. Joint (2005) argues that this move sparked a drastic change in individuals thinking about disability so people began to attribute disability to society’s refusal to adapt itself to the nature of “the disabled group” who as a result become socially excluded rather than seeing disability as a problem to the individual.

Closely related to the social model is the “Right-base Model of disability” which according to Harris and Enfield (2003) centered on fulfilling PWDs human rights like the right to health or education and employment which are often denied them so that they can have the same opportunities and share in society. A look at this model clarifies the need for the libraries' understudy to champion the cause of library users with disabilities by including them in every aspect of library service provision. This will have a positive impact on empowering the library users with impairments to share on an equal basis with the other users who have no impairments.

## **Types of disabilities**

### ***Physical Disability***

Researchers have described physical disability as bordering on a total or partial loss of an individual's body function which in turn affects the person's movement. Watson et al. (2020) declare that physical disability is a total or partial loss of an individual's bodily functions or the total or partial loss of a body part. Koulikourdi (2008) used the term “motor-impaired” to describe this disability. To her, they included people who have developed some of these types of disabilities: “quadriplegia, paraplegia, hemiplegia, craniocerebral injuries, or amputation of the upper and lower limbs.” Robertson (2007) posits that it may both be congenital or resulting from injury or disease and include “amputations, arthritis, back problems, cerebral palsy, multiple sclerosis, muscular dystrophy, post-viral fatigue syndrome, and spinal cord injuries.”

### ***Hearing Impairment***

Gilton (2012) states that hearing loss can affect one or both ears and vary from minor to profound and can be so severe that people have trouble processing linguistic information with or without amplification. Again, the differences may be that the person can be partially or deaf when hearing loss occurs and it is more difficult for children who are born deaf or become so before learning to talk to communicate using speech. Koulikourdi (2008) posits that deafness is proven scientifically as people who despite the use of hearing aids are unable to grasp ordinary speech through their hearing. The term “hard-of-hearing” describes someone whose hearing is slightly poor and seems not to be able to comprehend other speakers. Robertson (2007) on the other hand makes it clear that hearing impairment is often a hidden disability which may not be evident and there is a general misconception that people with hearing impairment cannot “hear any sounds at all” but that is not the case; “the person

is likely to be able to hear some frequencies and maybe lip-reading.” Robertson (2007) states that hearing impairment may range from people who may lose their hearing temporarily due to a medical condition that can be treated and those who deafness and hearing loss are permanent as well as people who have profound hearing loss and are profoundly deaf; these people have no hearing at all.

### ***Visual Impairment***

Robertson (2007) states that the Disability Discrimination Act (DDA) 2005 defines a visually-impaired person as someone who is “blind or partially-sighted or has uncorrectable sight loss or who has a physical disability which makes it impossible for them to hold a book or move their eyes.” Koulikourdi (2008) declares that the Greek legislation 958/1979 defines a blind individual as “someone whose visual sharpness is less than 1/20 of the norm, despite any possible medical intervention”. Persons with visual impairments, therefore, include “people with color blindness, cataract, tunnel, and peripheral vision, people with difficulty in reading the standard print and other several cases.” The World report on disability also declares that impaired vision can be due to either eye diseases or uncorrected refractive errors. WHO (2011) and Robertson (2007) make it clear that visual impairments can also be congenital or developed later in life. “Some conditions are stable, whereas others will worsen or fluctuate.” The grouping of persons with visual impairments is based on the amount of vision; that is people with low vision, people who are functionally blind, and people who are blind.

### **Barriers of PWDs**

#### ***Physical barriers in the built environment for PWDs***

According to Tudzi, et al. (2017) the built environment encompasses both the external environment around buildings and the internal spaces within buildings. Barriers in any of these can render the built environment hostile and unfriendly to PWDs and prevent them from accessing that environment. Mensah, (2008) assert that the physical and the built environment present one of the greatest challenges of providing equal opportunities and full integration of PWDs in the Ghanaian society. As WHO (2011) put it; a person’s environment has a huge impact on the experience and extent of disability. Inaccessible environments create disability by creating barriers to participation and inclusion. Examples of the impact of physical obstacles in the built environment as is identified by various studies include the following:

- i. Wheelchair users may be rendered disabled if they find themselves in a building without an accessible bathroom. That is the availability of a washroom that do not consider the extra room that is needed for a wheelchair user to maneuver through renders the washroom useless for the wheelchair user meaning that it will be like no washroom exist (Tudzie et al., 2017; Heaven, 2004; WHO, 2011; Robertson, 2007).
- ii. Persons with physical disabilities and visual impairments cannot access upper rooms in a story building if there is no elevator. That is if no stairs exist but rather elevators every part of that building becomes accessible to everyone irrespective of disability. (Tudzie et al., 2017; Craven, 2008; Todaro, 2005).
- iii. Steps, staircases, and ramps without handrails on both sides with tactile markings at the foot to warn PWDs. Handrails are very vital for persons with visual impairment since they trace it with their hand whiles walking to guide them to their destination so if they are not available it cause most persons with visual impairments to be mostly dependent on other people (Todaro, 2005; Tudzie, et al., 2017).

There have been several studies on library services for PWDs across the world which have revealed that these barriers also exist in libraries. Among the physical barriers revealed by Todaro, (2005) on "Library services for people with disabilities in Argentina" which focused on 20 different libraries in Argentina that provided services for visually impaired and physically handicapped people revealed that there exist architectural barriers which bring about environmental obstruction that are physical, like a lot steps in stairways, narrow doorways, the entrance of the building with steps and no ramp, amongst others. These foil free movement for PWDs. Heaven, (2004); Robertson, (2007) and among others made similar discoveries.

Although the 1992 constitution of the Republic of Ghana provided that any place to which the public has access shall have apt facilities for the disabled and the section 6 of the Disability Act 2006 (Act 715) states that "the owner or occupier of a place to which the public has access shall provide appropriate facilities that make the place accessible to and available for use by PWDs". Tudzi, et al. (2017) in a study found that libraries at KNUST were generally not physically accessible and this served as a deterrent to PWDs in their academic pursuits. Among other things, the whole library environment was hostile particularly regarding the physical access where building essentials like staircases and steps were poorly designed that stop PWDs from accessing the buildings. This goes to confirm

what Beaton, (2005) declared that Libraries form part of society and so can add to a “disabling environment”. Libraries consequently have a part to play in empowering the disabled to take a full and rightful share in community life.

### **Barriers to accessing service for PWDs**

Relating to barriers to accessing services that make people disabled, WHO, (2011) posits that policies and service delivery systems, including the rules underlying service provision, can pose as an obstacle that prevents individuals from sharing in the society so the world report on disability by WHO created some scenarios that makes it clear that barriers to accessing service can make people disabled.

Mensah (2008) makes it clear that the hearing impaired hardly gets “access to public information as both national and private information and communication service providers cut them out and many newspapers, books, and educative material are presented in the format that is inaccessible to the blind.” Meaning that though people get access to both private and public information as well as access to the content of any information materials of their choice for any purpose that they want to put it to; the persons with hearing impairments and the persons with visual impairments are excluded from accessing these information that may adversely affect them all because the service providers do not factor in the fact that in their bid to provide information and communication service they may need something extra like sign language interpreters or an alternative format of information before they can become functional in information access.

Concerning barriers to service access in the library, several studies that focused on serving PWDs in the library revealed that for the libraries to offer an inclusive library environment that does not prevent PWDs from accessing library services the library must be furnished with adaptive technologies and assistive devices. Joint (2005) stated that “larger libraries may have better resources to build a wide set of services like offering high-quality IT-based assistive technologies and create excellent infrastructural improvements to enhance the physical accessibility of the library environment.”

According to Joint (2005) if service providers fail to anticipate needs but rather react to needs and libraries fail to adjust their services in advance by including the demands of every patron then a disabling environment is created for definite client groups. Robertson (2007) in agreement with this statement declares that provision of service in an accessible and inclusive way is crucial and borders on a moral issue of human rights and a legal duty as attitude and improper or poor responses create barriers for PWDs.

### **Adaptive technological requirements of PWDs to overcome barriers**

Several studies across the globe (Watson, et al., 2020; Gilton, 2012; Koulikourdi, 2008; Robertson, 2007) among several others have revealed the various requirements that are needed to create an enabling environment for all the categories of disability. These requirements will therefore be needed to overcome physical barriers in the built environment, in accessing information and service as well as promote independent living of PWDs.

The requirements that are identified by the various documents and studies could be grouped into two; the requirement needed to overcome physical barriers in the built environment and the requirement needed to overcome the barriers to access to service.

Concerning the adaptive technological requirements of PWDs to overcome barriers in the library built environment, Garrod, (2004) declares that “adaptive, accessible, enabling and assistive technologies” are used interchangeably to mean “the software packages and equipment” that assist people with special needs to use computers and access the internet. The emphasis of this definition is on aiding PWDs to use computers and access the internet. Robertson (2007) on the other hand claims that it encompasses several electronic devices i.e. specialist software and/or equipment that enable PWDs to” bypass, overcome, or compensate for barriers to learning and access to information” so this definition focus on overcoming all barriers to learning and information access meaning if the built environment presents a barrier to learning these technologies can aid to do away with them. There are several initiatives on adaptive technology for PWDs by different libraries all over the world especially in advanced countries like the USA, Canada, UK, Australia, to mention but a few. Technology has made it possible for most of these initiatives.

Koulikourdi (2008) used the term “accessible tool” in her study “Assistive technologies in Greek libraries” to describe the adaptive technologies that are needed to overcome the barriers in the library built environment. Among such tools include the elevator and ramp.

This is used to overcome the physical barriers that stairs create to prevent PWDs from accessing upper rooms, especially in a storey building. Koulikourdi (2008) in her study “Assistive technologies in Greek libraries” that aimed at investigating the use of assistive technologies in Greek libraries reveal in her findings that some of the adaptive technologies found in Greek libraries included elevators and ramps that were highly patronised to overcome the physical barriers that prevent PWDs from accessing other parts of the library

that is likely to be out of reach if the library is to be a storey building. Irvall and Nielsen (2005) endorses the provision of elevator and ramp but insist that there should be rails at both sides of ramps and the elevators must be well lighted with buttons and signs in brail and synthetic speech. Tudzi, et al. (2017) discloses that the rails attached to the ramp or staircase are included in the universal design of buildings. A look at the findings from the study of libraries in Greece and the KNUST libraries in Ghana however showed a contradictory statement as the elevators and ramps were available and highly used in Greece than KNUST library did not have this adaptive technology.

Robertson (2007) observed that impairments that cause “mobility difficulties” as is the case of those who have physical disabilities and those with visual impairment are noticeable so people with this type of impairments may have to depend on “assistive devices”, like wheelchairs, scooters, crutches, and walking sticks. Irvall and Nielsen (2005) also make mention of the fact that persons with visual impairments must be able to walk with a cane and find their way into the library.

Moreover, Irvall and Nielsen (2005) indicated that doors must be fitted with automatic door opener so that no obstacles are found in the way of persons with visual impairment and wheelchair users and also insisted that the automatic door opener should be reachable by persons in a wheelchair. Heaven (2004) put it this way there must be a power-operated door that functions either by “a push pad or card swipe or a door controlled by a motion sensor or hands-free proximity reader.” Tudzi, et al. (2017) discovered in their work “Deterrent libraries: denying persons with disability” that though automatic doors were necessary and part of the universal design of buildings none of the libraries in KNUST had them and this is also confirmed by Heaven (2004) that the provision of automated doors at libraries entrances in the UK was often inadequate and this was attributed to lack of funding.

Koulikourdi (2008) in her study to describe the adaptive technologies that are needed to overcome the barriers to access information content of which the format of the information is inclusive. The equipment discovered by various studies to aid PWDs to overcome the barriers to accessing library service for visually impaired people: “scanners, screen readers, screen enlargement devices, speech synthesizers, tape recordings, personal computer with specialized software and hardware like CD-ROM drive and internet connectivity, Apollo II,

speech synthesis external unit, voice composer, book scanner with Optical Character Recognition (OCR) software, camera and microphone, text to speech software, Braille translator, Braille embosser, Braille display, Braille software for the conversion of the text to Braille format, Braille printer and closed-circuit television (CCTV).” All these types of equipment and software were useful for persons with visual impairments and were captured in the study of library services for people with disabilities in Greece (Koulikourdi, 2008) but the caution here is that they were woefully inadequate.

Robertson (2007) also prescribes that “the persons with visual impairments may require screen-reading software, Braille, tactile or audio recordings that rely on aural rather than visual processing.” Irvall and Nielsen (2005) also added on and declared that there must be “magnifying glass, illuminated magnifier, electronic reader and computers with screen adapters and software designed for persons with reading and cognitive disabilities.

The people with physical disabilities also need switches, switch interfaces, mounting systems, switches that require feet movements only, a joystick roller, trackball roller, PC control system by the head, screen reader, virtual keyboard, and software that simulates the mouse functions to support them (Koulikourdi, 2008). Irvall and Nielsen (2005) in their document “Access to libraries for persons with disabilities checklist” also indicated that there must be adaptive keyboards or keyboard overlays for users with motor impairments. Again Garrod (2004) endorsed keyboards with big keys and/or coloured keys; 'Gloves' that sit above a standard keyboard to make it easier to strike the required key; keyboard stickers, mouse alternatives like trackballs, touch-pads, and joysticks for people who cannot use a normal mouse.

For hearing-impaired people, Robertson (2007) also talked about hearing aids that hard of hearing people use. According to her, it works best in a quiet setting across a distance not exceeding 1.5 metres and in “one-to-one conversations.” In case there is noise or some people talking at a time or on windy days, the user of the hearing aid may need to use assistive devices like induction loops to eliminate background sounds. Irvall and Nielsen (2005) added that in the library setting the induction loop system should be located at the reference desk and circulation desk to aid them to communicate with library staff.

Additionally, alternative materials were also needed to overcome the information access barrier for persons with visual impairment. (Koulikourdi, 2008) Irvall and Nielsen (2005)

added that PWDS requires special media formats like talking books, easy-to-read books, Braille books, large print books, video/DVD books with subtitles, and/or sign language, talking newspapers, talking periodicals, E-books, tactile picture books. CD player, DAISY (Digital Audio Information System) player which is a digital talking book system.

For the accessibility of library websites, databases, and OPACs the library website design needed to follow universal design principles that ensure that website created is usable by all so some libraries OPACs were furnished with some adaptive technologies like text enlargement and speech synthesise (Koulikourdi, 2008) Irvall and Nielsen, (2005) state that for libraries to provide information to PWDs certain universal principle must be set which include information on the library's accessible website (that is the availability of audio information and text).

To conclude in this review, there are numerous adaptive technologies identified worldwide that can help PWDs to overcome the barriers in society. They range from specialised equipment or devices to specialised software as well as alternative format of information. To borrow from Gilton (2012) "adaptive technology can range from low-tech to high-tech, from simple to complex, from free or costly to extremely expensive, and it can be online or offline. Adaptive technology takes many forms such as simple tools (like a magnifying glass) to help in reading, adaptable furniture, or elements added to existing technology, handy elements used with other technology, such as thumb drives for computers and among others. Technology keeps on changing and keeping up with it is a serious challenge. Librarians must work with an advisory committee consisting of people and supporters from various disabled communities to ascertain most needed equipment, especially as needs change over time."

## **METHODOLOGY**

This study adopted the qualitative approach and involved interviews to collect the data. According to Creswell (2014), the qualitative approach involves a more natural setting where researchers collect data at the site. The researcher chose the University of Ghana, Legon (UG), and the University of Cape Coast (UCC) as the cases for this study as they were among the three public universities in Ghana that enroll students with all forms of disabilities. Again, they all have a significant number of students with disabilities and had the facilities that this research sought to study. The table below shows the population of the

study:

S/N	Institution	Librarian	Head of Unit	Students with Visual Impairments	Students with Hearing Impairments	Students with Physical Disability	Total
1	University of Ghana	1	1	37	6	37	82
2	University of Cape Coast	1	1	19	0	0	21
Total		2	2	56	6	37	103

**Table 1: Population of the study**

**Source: Fieldwork 2020**

How relevant the respondents are to the research topic determines the way the people to be studied is selected rather than their representativeness in qualitative research (Flick, 1998). The snowball approach was used to identify students with disabilities to form the sample size. All the two University Librarians and the heads of the units that cater to the needs of the PWDs were purposively sampled for the study. The thematic content analysis approach was used systematically to arrive at these findings. Out of a population of one hundred and three (103); twenty (20) respondents were selected and interviewed in the study representing almost 20% of the entire population which according to Campbell et al. (2020), is appropriate when the study aims to glean knowledge from targeted respondents deemed to have specific knowledge in the field of study.

### **Selection of Sample**

**Table 2 Sample size of the Study**

S/ N	Higher Education Institution(HEI)	Librarian	Head of Unit	Students with Visual Impairments	Students with Hearing Impairments	Students with Physical Disability	Total
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1	University of Ghana	1	1	6	2	3	13
2	University of Cape Coast	1	1	5	0	0	7
<b>Total</b>		<b>2</b>	<b>2</b>	<b>11</b>	<b>2</b>	<b>3</b>	<b>20</b>

## ANALYSIS AND PRESENTATION OF FINDINGS

### Barriers to Access in Libraries for Students with Disability

#### *Physical Access of Libraries*

Student respondents were asked to indicate how accessible the library was to them in terms of physical access. The physical access here sought to look at the parking lot, doors, stairs, ramps, elevator among others that one uses to gain access into the library and if these pose any challenge to respondents in their use of the library. The respondents in the management class were also asked questions to confirm the students' claims. Some of the questions differed a little from that which was posed to the students' respondents. The first objective questions for the heads of the unit were, however, the same as that of the students.

It came to light that out of the six (6) student respondents with visual impairment in HEI 1, three (3) indicated that in terms of physical access, availability of washrooms, and the available workspace; the library is accessible to some extent. This is captured in the responses below:

#### **Ama**

*“The library is accessible to some extent. The challenge arises when people park their cars on the street getting to the entrance of the library it makes it difficult to access the library since I bump into them when trying to access the library.”*

**Kofi** confirmed Ama's claim by saying that:

*“The library is accessible to some extent. It is only the irresponsible parking of cars at the entrance of the library by some library users that pose as a challenge and makes it difficult to access the library at times. I bump into cars sometimes when I try to access the library.”*

Two of the respondents with visual impairment in HEI 1 however opposed this view and

indicated in their response that the library is accessible.

**Yaw** had this to say:

*“If I’m moving from my hall to the library, because I’ve been thought how to move around ... I trace the gutters with my white cane that is the device that helps me when I get there sometimes the security men give assistance and guide me to the room so for me physical accessibility is okay”*

Only one of the respondents with visual impairment in HEI 1 was of the view that physical accessibility was not good at all. This is found in his response quoted below:

**Kuuku:**

*“For me, since I’m in level 100 it seems to be somehow difficult for me because I don’t know entirely (the) place, and what I know is maybe ... sometimes I could miss a step so for me I think it is not easily accessible to me”.*

For the respondents with hearing impairment in HEI 1, their responses were quite different from those with visual impairment. They had fewer answers because they had their sight and they could walk so their outlook of physical access to the library was just like students without disability.

The response from **Kobby** confirmed this claim: *“For me everything is okay”*

The students with a physical disability, on the other hand, had some issues with the physical accessibility of the library in HEI 1. It came to the fore from the response of one (1) of them that though physical access to the entrance of the library and the ground floor as well as the first floor of the library was accessible because of the ramp leading to the first floor, the subsequent floors were however inaccessible. This meant that the reading rooms upstairs were not accessible at all. This is captured in the response below:

**Gyasi:**

*“It is not all that accessible to me but going to the library is very easy but sometimes when I am searching for a book, I have to move upstairs so if I don’t get anyone to help me by going upstairs to ... get the material I need for me it will be very difficult for someone in my situation to do that.”*

**Mavis** confirms Gyasi’s claim by saying

*“The other rooms that are upstairs I think they will be very inconveniencing since there is no*

*elevator there generally I think it is a bit limiting.”*

**Mavis** however had this to say:

*“in accessing the library, usually when you are going you have to leave your things before you enter the library so before I got to know that people with special needs were not supposed to, I wasn’t going to the library so when I found out that I could go inside with my bag because it was a lot of trouble for me taking out my things, taking off my bag, yes for me that was my only challenge because I can walk so ... my personal need is addressed so accessing the library is easier for me”*

This response generated was based on the fact that she had an amputated arm resulting from an accident so to her the library was accessible; she could walk, unlike her male counterparts who could not walk without the aid of crutches.

Findings gathered from respondents in HEI 2 revealed that out of the five (5) participants; four (4) agreed that the library is accessible in terms of physical access. Here are some of the responses that attested to that fact:

**Eddy:**

*“It’s accessible but there are so many staircases; that is where there is a challenge but on the whole it is accessible.”*

**John:**

*“... it’s quite okay yes I’m familiar with the environment here so I am okay. I am in level 300 so I am familiar with this environment.”*

**Lucy:**

*“... I have little sight yes I can see small and walking alone is not a problem for me.”*

**Becky** was however of the view that no one can isolate the library from the university environment so if the university environment was not accessible to students with visual impairment then definitely the library cannot be physically accessible so she made this assertion:

*“From the main campus up to this place is not that accessible because you know the environment has not just been done for visually impaired so that there will be environmental hallmarks ... For instance, rails, if it has been mainly an environment for us there will have*

*been something like rails where you pass you have your hands by it till you finally branch to the library but in our case, it is not that. And then also they have a car being parked at all along so it is not that accessible without assistance.”*

The responses from HEAD 1 and HEAD 2 affirm the students’ claim that to a large extent the libraries understudy was accessible to PWDs to some extent so they had these to say:

**Head 1:**

*“The parking lot is okay; it is flat so that even those who use wheelchairs can use it without any problem. It’s on the ground floor so that one too it is okay. It is also accessible to the wheelchair users and for the blind so it is not bad but then if they want to go to other sections of the library, some are upstairs and so it becomes difficult. There is a ramp to the first floor but on the other floor there is no ramp neither is there any elevator. At the entrance of the library, there are no proper ramps. It is just a wooden one which is even broken.*

**Head 2**

*“The library ... is not accessible at all especially for the physically challenged like someone in a wheelchair. Now we thank God that the elevator has been repaired so if the person wants to come here he can use the elevator on the ground floor and then come to our place here so, for now, I can say that it is accessible.*

***Available place of convenience***

On the issue of the place of convenience, four (4) of the student respondents from HEI 1 commented on the fact that it is accessible but there are no special washrooms dedicated to PWDs. Another observation was made by Kekeli that the place of convenience may not be conducive for wheelchair users. Some of these responses are captured below:

**Kojo:**

*“We don’t have any specific washroom for PWDs; it is the normal washroom that everybody goes to use.”*

**Kekeli:**

*“There is a place of convenience for all students and that is where we all use. For me, as a visually impaired person, I may say the washroom is accessible but maybe to my colleagues who are physically challenged they may have a problem in accessing such facility especially*

*for wheelchair users.”*

All five (5) respondents from HEI 2 agreed that the place of convenience was okay and accessible. Some of their responses have been captured below:

**Lucy:**

*“We have washrooms here.”*

**John:**

*“For the place of convenience, it is somehow okay.”*

Management also affirms what the students said in what pertains to the two institutions in terms of place of convenience.

**Head 1** responded by saying:

*“The toilet facility we have here is also on the ground floor just that there are no specialised toilet seats and the rooms are even small so when you are going in with a wheelchair it is a bit difficult ...”*

**Head 2** emphasised that:

*“They have a separate washroom for our students when they come to the unit... it is only the students that use them and not staff.”*

### **Available Adaptive Technologies in the Libraries**

This objective set out to find out how the respondents were introduced to the available adaptive technologies in the various library, how user-friendly these technologies were, how accessible the libraries website and Online Public Access Catalogue (OPAC) was and how the libraries could improve on the available infrastructure (adaptive technologies) in the libraries.

### ***Introduction to Adaptive Technologies in Libraries***

The question that bothered on how respondents were introduced to the identified adaptive technologies generated these responses from some of the respondents from HEI 1:

**Ama:**

*“... through the orientation that was given to us when we first came to the university.*

*There is also the midterm arrangement for the visually impaired to go to the library to be trained to use the computers and the other facilities available in the library but I already knew how to use most of them.”*

**Kofi:**

*“It was through orientation and friends. The ‘Unit’ organized an orientation for us to introduce us to the facilities available to us and my sighted friends led me to the library until I became familiar with the place ...”*

Conclusions arrived at by the look at the responses generated from the respondents from HEI 1 shows that the students with visual impairment were introduced to the available adaptive technologies through orientation as was indicated by all the respondents. Kofi also made it clear that their friends also assisted them. Ama made the researcher aware that they also have a midterm arrangement for the visually impaired to go to the library to be trained to use the computers and the other facilities available in the library.

The respondents from HEI 2 also confirmed the views of their fellow respondents in HEI 1 as to how they were introduced to the available adaptive technology. They too had orientation sections and a training section as to how to use the adaptive technologies. Their views are captured in the following statements:

**Lucy:**

*“... some of us like this we didn’t know anything about ICT so the resource persons some are assigned to teach us ICT and they taught us how to use the computers to read and how to type with it. And then using the CCTV, this is my first time of really using it to read. So they assisted us.”*

**Tom:**

*“When you come to this library you saw some desktop computers around so we have someone who is solely in charge of our training; when I came here I was told that we apart from our main timetable with the lectures that we have, you find your own time and go and register with the person; ... then the person takes you through so that is what I was introduced.”*

**John:**

*“When we came at first orally we were told and they even brought us in here to show us some*

*of the thighs that we have and they took us through the various rooms that are there they make it known to us and then we came to the practical aspect of it which they thought us how to be using them.”*

### ***Ease of use of the adaptive technologies introduced to respondents***

The second question under this objective had to do with how easy it was for respondents to use the adaptive technologies they were introduced to. The views of some respondents from HEI 1 are captured below:

#### **Yaw:**

*“Yes, they are easy to use. It only becomes difficult when the machines become faulty and at times if the speech is not coming then the librarian will try to help you out by turning on the speech.”*

#### **Kuuku:**

*“For the computers, if we have the speech software on them it will be very easy ... to use them but if there is no speech software, how can I use them? I use this speech software to hear, to read, and also to write so if the speech software is not on the computers then it means I can't use them ...”*

#### **Kojo:**

*“As for being user friendly they are but every technology has its challenges. There are sometimes you go to the offline library and the things there your assistive technology will not be able to read the thing to you so in that field you will not know whatever you are searching for. You will not get it so you will still have to rely on someone who will be able to read to you. If I have a technology that could speak to me, I expect that the URL of the university website will be compatible with the technology so that when I go there I will not look for an assistant from somebody the assistance will be minimal.”*

From the responses captured above, all the respondents from HEI 1 affirmed that adaptive technologies are easy to use due to the speech software installed on them. One significant theme that was generated from the responses from Kojo, Kuuku, and Yaw was the challenges that arise from the use of these technologies. Among these challenges included faulty machines as was stated by Yaw, incompatibility of technology with the document one needs to access as was indicated by Kojo, and lastly if the adaptive technology is there but the

software that is needed to access them are absent as was stated by Kuuku.

The respondents from HEI 2 also had these to say on that same question:

**Lucy:**

*“First it wasn’t easy. With the ICT for instance, first, it wasn't easy but with the CCTV it was okay. you see using the software to read you listen to the voice so when it is reading me at first it reads fast so I find it difficult hearing the words it is pronounced but now as I use it gradually I became used to it.”*

**John:**

*“they are okay because of the support of the NVDA and JAWS”*

From the responses above gathered from the respondents from HEI 2, the majority of them agree with the assertion made by the students in HEI 1 that the adaptive technologies are easy to use due to the speech software installed on them. Lucy agrees that some of the adaptive technologies are easy to use like the CCTV but some of them also take time for one to get used to. For example, learning ICT and using speech software.

The management respondents were also quizzed on how easy a user can learn to use the available adaptive technologies in the library. This was to find out if the available adaptive technologies for PWDs in the library were user friendly. In response to this question HEAD, 1 made it clear that apart from the CCTV and the computers with the speech software installed on that the students use by themselves; the rest of the adaptive technologies were operated by the resource persons in the Unit Library. HEAD 1 also made it clear that the CCTV and the computers with the speech software that the students operate by themselves are easy to use. These findings confirm what most of the students said that adaptive technologies like the CCTV and the speech software on the computers make them user friendly. These are captured in the response below:

**Head 1:**

*“apart from the CCTV that the students use, the scanner and the other things the resource person does it for them but the CCTV is very easy and not difficult to use. And then the software installed on the (computers) to be used by the visually impaired it is not all that difficult to use ... you just have to listen and pay attention to it”*

HEAD 2 on the other hand made it clear that it was not easy training the students with visual

impairments to become computer literates. The challenge that the ICT training section suffered stemmed from the fact that the period that this training section could be fixed for all the students to benefit was difficult to allocate since all the students had different timetables for their courses offered on campus. As a result, the Unit had to organise some of these training sections during the university's vacation period even though the students could go and make personal arrangements for their ICT training. This response confirms what some of the student respondents from HEI2 said that it was not easy to get trained in ICT and that the students can make personal arrangements with the Unit Library to be trained in ICT. The response from HEAD 2 is seen below:

**Head 2:**

*“(For the) visually impaired it is not easy at times you will need to take time because I did say that we train them to become computer literate most of the time it crashes with their periods so we’ve arranged it in such a way that when they are free and they don’t have any period before they come. At times too, their time table becomes very loaded so at times it becomes very difficult for them to come and have that lesson that is why we’ve taken it upon ourselves that at the end of every 2<sup>nd</sup> semester after the examination we set about two weeks aside and we do intensive ICT training for them.”*

***Accessibility of the Online Public Access Catalogue (OPAC) and the library’s web pages***

How accessible the libraries OPAC and the web pages to the amazement of the researcher, only a few of the respondents had heard about it not to talk of using it. Almost all the visually impaired respondents from both HEI 1 and HEI 2, the hearing impaired as well as those with physical disabilities have never accessed them before so they could not give any concrete answer as to whether they are accessible or not. The responses below captured all that was gathered from some of the respondents in both institutions:

**Kekeli:**

*“It is not easily accessible so we quite often request for assistance from other people to know what is available in the library.”*

**Kojo:**

*“More must be done to improve accessing the UG Space that means that the assistive technologies to access the HEI 1 Space.”*

**Eddy:**

*“no-no, I have not accessed it. ... I know that there is something of that sort but I have never accessed it before.”*

**Joe:**

*“ Okey to be honest I have never used it before”*

On the issue of how easy could, PWDs learn how to use the available adaptive technologies, how disability-friendly was the library Home-page and OPAC to PWDs, and the special features that make the library Home-page and OPAC disability-friendly. These questions were to find out the available adaptive technologies in the libraries and whether they were user friendly to PWDs in the library. Again since the environment of the library is most often associated with information access and there is a lot of information and services that are provided by the libraries Home-page and OPAC, it became necessary for the researcher to enquire about them because the library Home-page and OPAC were dependent on adaptive technology like the computer with internet connectivity. The question posed by the researcher on how disability-friendly the library Home-page and OPAC was to PWDs generated the following statements below from the management in HEI 1:

**Head 1:**

*“for the visually impaired they complain that they are not able to navigate to get to the library even when they get there looking for the information is difficult ... I can do it but then I have had a few complaints from the visually impaired that it is difficult going on the webpage”*

This response shows that the HEI 1 library webpage as well as the OPAC which is one of the major keys in the library for accessing information was not disability friendly because the needs of the students with visual impairments were not considered when they were built. This finding is affirmed by **LIBRARIAN 1** in answer to this question had this to say about the library homepage and the OPAC:

*“It was not created for disabled people so we don't have any software which can be able to read for them. ... For the visually impaired if they wish to read unless of cause they have*

*software in their unit where they will be able to read.”*

***Improving the available infrastructures that support PWDs in the library***

The last but not the least question under this objective was to solicit suggestions from respondents on ways of improving the available infrastructure that supports PWDs in the various libraries. The following suggestions below were made by the respondents from HEI 1:

**Kojo:**

*“I believe that they can make the library open irrespective of your disability if the right equipment is there. There shouldn't be a space that this is the place for the blind or PWDs whatever you are looking for you can go for it in the library but once they make it restrictive there are things that will be restricted but if the library is opened you could go to any other sections of the library if you need somebody to speak to but once it is restrictive, the people who will be able to help you once they go home you will not be able to do anything. So at least the staff should be all day round like they do it for the other students without impairment. The rumps that lead to the library is not of standard they are wooding and looking at a university of this stature to have a wooden rump if they do the ramp very well as they did it for the extension of the 'Unit Library' you can move with the wheelchair wherever you want to go without any problem but the wooden one how long will it last. The library management will have to look at the accessibility of other users of the library like the wheelchair user. For me, you cannot have everything the way you want it so at least if they meet you in a halfway you will be able to strive your way through and get access to what you are looking for.”*

**Yaw:**

*“Well, rail should be fixed. You see the pavement when you use the Dean's office line when you need to go to ... and you turn to your right there are gutters at your left and where cars are mostly packed sometimes it is confusing I mean if you are going. Some are packed close to the staircase that will lead you to where the security post is in the library. So if proper arrangements could be made for drivers or cars to be parked at a different place so that things become more convenient then we will not be confused or even if a rail can be put along the gutters so that you can trace it or hold it with your hand that metal we can hold it will make it more friendly or maybe if signpost may be mounted on the way so that if drivers*

*are coming they will slow down a bit because they should be aware that we are also here. I think they have improved on the staircase where wheelchair users can easily use the place but they should do it to other places too.”*

**Kofi:**

*“The library should get us the information that we need as students reading different courses by providing alternative formats (i.e. softcopies, audiobooks, and braille materials) of the reading list of the various courses that are mostly read by visually impaired students in the ‘Unit library’ so that we too can access them. The computer lab designated for PWDs does not have enough computers and the ones available even some are not in a working condition so the library management should fix the ones that are not working and get us extra new computers with the speech software. The ‘Unit library’ has a very poor internet facility so if the library could enhance the internet facility in the ‘Unit library’ it would go a long way to help us search for information that we need online. The available space for the students with special needs is not big enough to accommodate all of us so the library should get us a bigger space especially during examination periods when the majority of us use the library.”*

The respondents from HEI 2 also made some of the following suggestions as to the ways of improving the library’s infrastructures:

**Lucy:**

*“We don’t have brailled books like our sighted colleagues so if they would have helped get us some books in Braille so that when we also come we can get some to refer to ... and then there should be an improvement of our desktop that we use.”*

**Eddy:**

*“at least they have a lift or elevator here they should make it functional and at the entrance, there are a lot of obstructions over there so if they can remove some of them...”*

**John:**

*“they can improve upon it I mean if they bring more information that we need like all those books in the library that they have in the library at least they should convert all of them to the computers too for us here so that we too we can equally do our research and another sort*

*of things and then get more computers and then improve upon the space so that at least when we are here with our this thing (helpers) too it will be very easy for us.*

These suggestions gathered from the two institutions under study revealed that the students need are similar in the sense that respondents from both institutions suggested that there is a need for both libraries to improve upon their adaptive technology like the computers, there was a need for a bigger workspace for PWDs in the libraries just that the need for such thing was more pressing in HEI 1 than in HEI 2 as was indicated by the number of respondents who made that suggestion from their responses as well as there was a pressing need for alternative formats of the information material.

## **DISCUSSION OF FINDINGS**

### **Barriers to access in the libraries for PWDs**

It was revealed by the findings that with regards to physical access and availability of washrooms to the students with disabilities; the respondents were not satisfied with access to the library environment. The dissatisfaction with access to the library by PWDs in the selected cases resulted because there were lots of barriers in the library environment. The barriers noticed in the selected libraries included inaccessible building, lack of alternative format of information materials, non-functional and inadequate adaptive technologies, and among others. It should be noted that for the provision of adequate building facilities (Todaro, 2005) claims that there should be no architectural barriers making environmental obstruction of physical in nature, like excessive steps in stairways, narrow entryway, steps at the building entrance with no ramp, and many more others. This averts free movement for disabled people and curtails their right to free movement. In effect, this will contradict the section 6 of the Ghana Disability Act 2006 (Act 715) that urges owners or occupiers of a public place to provide apt facilities that make it open and available for use by PWDs and also obliges public service providers to ensure that such services are accessible to PWDs.

### **Barriers in the libraries-built environment**

In terms of physical access, the findings indicated that; one of the case studies did not have an elevator or ramp leading to the upper levels of the library so students with physical disabilities and visual impairments needed to deal with many stairs thereby preventing them from accessing that part of the library. This confirms what Mensah, (2008) declared that the

built environment presents one of the major challenges of giving equal chance and fully integrating PWDs in the Ghanaian society. All the cases once more did not have rails to guide the students with visual impairments into the library. This is similar to the finding made by Tudzi, et al. (2017) that there were no lifts at KNUST libraries but conversely, the results from the studies of Koulikourdi (2008) and Heaven (2004) showed that the majority of libraries in Greece and UK universities had lifts and ramps. Tudzi et al. (2017) attributed the lack of elevators in public academic libraries in Ghana to the expensive nature of their installation.

It was evident in the findings that though toilet facilities were found in the two cases of study they did not consider the extra room needed for wheelchair users to maneuver their way through. A similar observation was made by Heaven (2004) that most of the toilets in the five higher educational institutions she studied did not have extra room for “wheelchair users” to maneuver through. The worst situation persisted in the KNUST library as many of the washrooms were found outside the library buildings. (Tudzi et al., 2017).

Though some of the literature reviewed (Heaven, 2004; Irvall & Nielsen, 2005) indicated that libraries should be furnished with adjustable furniture and automatic doors none of the cases studied had them. This discovery, therefore, contradicts section 6 of the Ghana Disability Act 2006 (Act 715) which stated that “the owner or occupier of a place to which the public has access shall provide appropriate facilities that make the place accessible to and available for use by PWDs”.

From the findings generated from this study, it can be concluded that things within the library environment like furniture, access to service, and among others can go a long way to either include PWDs or impede PWDs from using the library.

### **Available Adaptive Technologies in the Libraries**

#### ***Ease of use of the available adaptive technologies in the public academic libraries***

The findings revealed that the students with a visual impairment from both study areas were introduced to the available adaptive technologies through orientation and special training sections. The findings also affirmed that adaptive technologies were easy to use but difficulties can arise when using these adaptive technologies. Among these difficulties included faulty machines, incompatibility of installed software with the document one needs to access as well as if the adaptive technology is available in the library but the software such as the speech software that is needed to access them is absent. It was also revealed by the

findings that some of the adaptive technologies were easy to use like the CCTV but some of them like learning to use the computers and using the speech software takes time for one to get used to.

### ***Improving the available adaptive technologies in public academic libraries in Ghana***

On the issue of improving the available adaptive technologies in the library, the findings revealed that there were obstacles in the library environment that needed to be dealt with so that the libraries can create an enabling environment. For this to be achieved the libraries had to be furnished with a bigger workspace that has modern adaptive technology and furniture for PWDs. The creation of an enabling environment for PWDs may however not be achieved because the challenges faced by the PWDs in the Unit Library included having many obsolete, non-functional, and inadequate adaptive technologies as well as unstable internet connectivity. This finding is consistent with the discovery by Kwafoa, (2016) that for library services to improve other infrastructures like friendly walkways in and around the library, assistive technology, a good car park at the front of the library, computers with

JAWs software installed, tables for Braille books, extra toilets, reading machines, and Braille dictionary needed to be added.

Furthermore, the library ought to provide alternative information formats for the PWDs since they form part of the library patrons and therefore needed to be considered in the provision of library service to create an inclusive library environment. The alternative format of information can be achieved only if the libraries make provision for adequate adaptive technologies like embossers, scanners, and among others that can be used to convert the printed materials that form most of the library collection. All these, in the long run, will help do away with segregation that PWDs face from the rest of the library users (Koulikourdi, 2008) was hence right to point out that the “collections enrichment with alternative material and assistive technology devices are not sufficient.”

Finally, physical barriers in the library environment could be removed using adaptive technologies. This can be done by building standard ramps and installing elevators for students with physical disabilities and fixing rails for the students with visual impairment to use to navigate their way into the library (Tudzi et al., 2017).

## **CONCLUSION**

To sum up, there is a growing trend of disabilities worldwide and this reality is also reflected in Ghana so libraries; more especially the public academic ones should seriously consider PWDs in their service delivery by embracing adaptive technologies for disabled users. Adaptive technology devices are needed by PWDs but they are woefully insufficient even though they are considered to be very important for achieving equal access to the library built environment and information services delivery. Taking into consideration the above, libraries in Ghana will do well for PWDs if they accept adaptive technologies. Given this, it would be prudent for public academic libraries in Ghana to follow the example of other updated international libraries because they have the potential to help PWDs to overcome the barriers in the library environment and take advantage of new technologies to expand their services for PWDs and offer inclusive library services. That is why several recommendations that might improve this situation have been provided at the end of this study.

### **Recommendations**

1. In the architectural design of public academic libraries in Ghana, it is recommended that there should be points of access and disability-friendly among others that ease the movement of PWDs. Libraries and Librarians should also be involved in conducting accessibility audits with universal design in mind so that all barriers to physical access to the library can be dealt with.
2. A separate department for persons with reading, hearing, and other disabilities as suggested by IFLA is laudable and should be implemented by the two university libraries. This would enhance the quality of living for PWDs as it would help them feel comfortable in the library environment since they would not disturb other library users when they use adaptive technologies.
3. The libraries should improve on and ensure proper maintenance of the available adaptive technologies such as computer software to make the library inclusive for PWDs. This would contribute decisively to eliminating the gap between PWDs and non-disabled persons by improving information access among PWDs.
4. As much as possible the two University Library's websites must be simple, consistent, clear, multi-modal, or able to provide content in multiple media, error tolerant, and attention focusing on accessibility.

5. Furthermore, despite the inadequate financial support for libraries in Ghana provisions must be made for PWDs by the Management of the two Universities since they are part of the library users.

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