Information Communication Technology (ICT) use for information access by visually and physically impaired persons in public university libraries in Kenya

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ABSTRACT

This article is a spinoff of a doctoral study that was completed at the University of KwaZulu-Natal (South Africa) in 2018 on provision of information services to persons with visual and physical impairments in public university libraries in Kenya. The article examined how ICTs such as internet, e-resources and e-databases, word processing, websites and more were being used in public university libraries to provide access to information by visually and physically impaired persons. Data were collected from the visually and physically impaired students, University Librarians, Systems librarians, staff from disability departments and library staff who provided services to visually and physically impaired persons. The findings revealed that the visually and physically impaired persons in most of the libraries could not access information owing to lack of the necessary assistive and adaptive technologies and weak institutional support and framework. The study recommend that the libraries improve assistive technology infrastructure, embrace new assistive technologies such as telepresence robots, virtual realities and more, and put in place enabling policies and capacity building programmes for library staff to enable them to provide services to persons with impairments.

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1. Introduction

Information is a fundamental resource and the driver for socio-economic and cultural development of any nation including its people (Saleem, Shabana, & Batcha 2013, p. 50). Furthermore, it is considered a basic human right. Information must therefore be made available to all without exception. Increasingly, ICTs such as mobile phones, computers, network hardware and software among others are used in the production, storage, processing, distribution and exchange of information. The importanc e of ICT in enabling access to information irrespective of temporal and spatial considerations cannot therefore be underestimated. Ogunsola and Okusaga (2006) add their voice on the importance of information in socio-economic and cultural development pointing out that it is one of the major driving force of globalization. While globalization is a critical factor in socio-economic and cultural development especially with regard to democratizing information access, it is also associated with the growing information asymmetry among people. In this regard, Owei, Bada and Aniebonam (2006) assert that there exists a barrier of information deprivation occasioned by the modern shift in globalization and transformation of the society by information and knowledge. This barrier results from lack of information itself, unavailability of appropriate tools to access existing information or generate desired information, and lack of information in accessible format especially for use by visually and physically impaired persons.

The terms such as information asymmetry, digital divide, and information poverty have emerged to describe existing information imbalance especially between the more developed global north and less developed global south. The digital divide in its broader sense is also used to describe the difference between people who possess the skills, knowledge and abilities to use the technologies and those who do not (Beal, 2017). This is caused by factors such as prohibitive cost of computer and internet connection, the lack of supporting communication infrastructure and weak institutional framework. Intrastate digital divides also exist among the different echelons of society such as the rich who have access to modern and sophisticated technologies and the poor who do not have such access. Proper and equitable access and use of ICT is a critical component of inclusive information societies characterized by social progress and economic growth (International Telecommunications Union- ITU, 2013). In the last five decades, the world has undergone fundamental transformation occasioned by the introduction of ICT in every sphere of life (Mairaj & El-Hadi, 2012) including education, research, government, transport and communication, health, agriculture, business, industry and more.

The digital divide is more pronounced where the penetration and distribution of ICT has failed to reach the most vulnerable and disadvantaged groups in society such as people with physical and visual impairments (Khachatryan, 2014). Whenever ICT is not properly deployed equitably, it becomes a tool for social exclusion from access to job opportunities, access to education, access to healthcare, housing and government services. The vulnerable groups in society become increasingly isolated and disenfranchised. On the contrary, ICT when well deployed provides a wider strategy for social inclusion (Shuja, 2008). Appropriate and proper deployment of ICT can enable people with physical and visual impairments to participate fully in social and economic life of their communitie s, as well as being a significant force in terms of choice and opportunity. ICTs especially assistive

technology and devices can help ameliorate social isolation and stigmatization among persons with impairments (Dobransky & Hargittai, 2006).

ITU (2013) underscores that the lack of access to ICTs by persons with impairments deprives and denies them equal access to education, culture, and daily services. Subsequently, their chances of securing employment and living independently are limited. Governments the world over now recognize that universal service and universal access policies are important interventions in creating inclusive information societies to help achieve sustainable development goals (SDGs).

1.1 Role of libraries in creating inclusive information societies

Libraries in general play a pivotal role as vehicles of formal and informal education (Babalola & Yacob, 2011). Academic libraries on the other hand have the major role to support teaching, learning and research in the university (Okonedo-Adegbaye et al., 2014). Academic libraries can therefore make a remarkable contribution to increasing digital inclusion and participation (Frank et al., 2021). For this reason, academic libraries especially in the global north for example United States, United Kingdom and Canada have taken steps to provide visually impaired persons the opportunity to access digital information. This is achieved through provision of assistive technologies including screen readers and screen reading software; suitable work stations with large monitors, adjustable desks and chairs, large keyboard and more. At the same time, training sessions have been organized for the library staff to enable them effectively communicate with visually impaired persons (Tripathi & Shukla, 2014). Islam and Islam (2006) point out that the advent of ICT brought about profound changes in Library and Information Science including but not limited to providing efficient and effective access to information as well as overall delivery operations (Mutula & Majinge, 2016). Libraries are therefore no longer viewed in the traditional sense as store houses of books but as intellectual centers of electronic information (Mahesh & Mittal, 2008). As pointed out earlier, ICT especially when deployed appropriately help to decrease the digital divide between persons with impairments and those without impairments by bringing information on their desktops.

Caldwell (2006) opines that the increased availability of educational web resources accessible on or off campus through the libraries websites, affords increased scholastic opportunities for persons with impairments. To ensure universal accessibility to this information for all library users, careful consideration should be given to the design and accessibility of university websites, library databases, library catalogues (OPAC) as well as online learning resources and services (Caldwell, 2006). Libraries therefore have a moral duty of ensuring access to information by all library patrons irrespective of their abilities (Zaid & Zaid, 2017) through provision of the necessary assistive and adaptive technologies.

1.2 Objectives of the study

1. To assess the importance of ICT in provision of access to information for persons with impairments
2. To examine the use of ICT by persons with impairments in libraries
3. To investigate the assistive technologies and devices provided by the libraries for persons impairments
4. To investigate the challenges faced and propose amelioration strategies to enhance access to information by persons with impairments

2. Literature Review and Theory

The International Federation of Library Associations and Institutions (IFLA) developed a Checklist known as Access to Libraries for Persons with Disabilities. The checklist is a useful tool to assess the levels of accessibility to buildings, resources, services, and programs for visually and physically impaired persons (Irvall & Nielsen, 2005). The Checklist also prescribes design of physical access outside the library, entrance to the library, access to the resources such as physical space, washrooms, circulation desks, reference/information desk as well as departments for persons with impairments. The Checklist also makes provision for media formats of information such as special medias and computers for persons with impairments. Moreover, the Checklist advises on training of library staff, as well as special services including how to provide information to persons with impairments.

Similarly, the Social Model of disability (Oliver, 1990) was developed to facilitate inclusive information access by physically impaired persons. The Model was influenced by the British disability activists in the 1960s and the 1970s (Retief & Letšosa, 2018). It came into existence as a result of the writings of the Union of the Physically Impaired against Segregation (UPIAS) (Oliver, 2004, 2013). The Social Model of disability sees disability as a social problem whereby the society fails to pay attention as well as address the needs of persons with impairments. The Model focuses on the barriers that restrict persons with impairments including negative attitude (institutional discrimina tion in form of inaccessible buildings and unusable transport systems); segregated educational systems, work systems and many more (Du Plessis, 2013). Owens (2015) is of the view that the Social Model of disability has markedly succeeded in challenging discrimination and marginalization of visually and physically impaired persons.

The IFLA Checklist and the Social Model of disability combined with assistive technologies have helped to improve information services to persons with impairments. According to the US Assistive Technology Act of 2004, assistive technology refers to “any item, piece of equipment, or product, whether it is acquired commercially, modified, or customized, that is used to increase, maintain, or improve the functional capabilities of individuals with disabilities” (World Health Organizat ion, 2011). Assistive technology and devices are helpful in accommodating restrictions of activities of daily living that are caused by disabling conditions, as well as reducing the level of unmet

needs (Thompson, Fisher, & Kayess, 2012). Assistive technology enhances functional independence and increases participation for persons with impairments (World Health Organization, 2011). The Social Model of disability recognizes that ICTs can be liberating and they can help in eliminating barriers facing persons with impairments (Varney, 2013). The IFLA checklist requires libraries to ensure accessibility to computers, websites, catalogs as well as eBooks for persons with impairments. In this regard, libraries should provide screen readers and text enlargement software. Furthermore, libraries should provide speedy and reliable technical support for both computers and adaptive equipmen t (Irvall & Nielsen, 2005).

A study in Argentina by Todaro (2005) revealed that lack of assistive technology and computers hampered information service provision to persons with impairments in the libraries that were surveyed. Dodamani and Dodamani (2019) similarly surveyed libraries in India and revealed that majority of them did not provide assistive technology such as screen magnifying software, screen readers, Scanning and Reading Appliance (SARA), Daisy, and digital recorders for use by visually impaired persons. Sanaman and Kumar (2014) in another study conducted in India, revealed that persons with impairments in the National Capital Region Libraries were unable to access information due to unavailability of assistive technology and devices. Similarly, Bhardwaj (2018) in a study on libraries of higher institutions of learning in India revealed that most of the libraries lacked the basic assistive technology and devices to enable visually impaired persons to access information.

Within the African context, Abdelrahman (2016) study conducted in Sudan found out that the visually impaired students experienced difficulties accessing information services due to inadequacy of assistive technology as well as lack of training in the use of existing assistive technology. Likewise, Zaid (2017) found that visually impaired students in university libraries in Nigeria encountere d obstacles while accessing information due to lack of computers, assistive technologies, and lack of computer literacy skills. Similarly, Kotso & Mohammed (2011) in a study also conducted in Nigeria found out that libraries of Plateau State Special Educational Institutions did not provide the necessary assistive technologies and devices such as screen readers, Close Circuit Television (CCTV) magnifiers, scanners, and text to speech software. In Kenya, a study by Nyaboke (2018) found out that university libraries in Meru County lacked assistive technology and devices such as wheelchairs, text to speech software, telecommunication devices for the deaf (TDD), and magnifying glasses. Libraries need to explore and embrace emerging assistive technologies so as to leverage the opportunities and benefits they provide. Assistive technology can enable persons with impairments to access their human rights, attain digital literacy, complete their education, get and retain employment and live comfortably in their communities (Enable Ireland, 2016).

In the current fourth industrial revolution (4IR) dispensation, more sophisticated technological development is bringing great independence to persons with impairments. An array of new technologies bringing together digital, physical, and biological worlds have emerged in all disciplines, economies and industries (Schwab, 2016). The Internet of Things (IoTs), robotics, virtual reality (VR), and artificial intelligence are some of the technologies greatly impacting the lives of persons with disabilities (Wigmore, 2019). The development of sophisticated assistive technologies such as Brain in Hand autism support app helps autistics remember activities and manage anxiety (Calderdale Council, 2018). In addition, telepresence robots for persons with motor disabilities (Brewster, 2015; Leeb

et al., 2015) and virtual reality (VR) projects are assisting persons with special needs including visual impairments to adapt to specific situations (Jeffs, 2010). These technologies have great potential for academic libraries to create more inclusive environments for persons with impairments.

3. Methodology

This study adopted a survey research design. Six public universities in Kenya were involved in the study. The universities were purposively selected because they had a long history of enrolling visually and physically impaired students. The universities that were surveyed included Egerton University, Kenyatta University, Jomo Kenyatta University of Agriculture and Technology, Moi University and the University of Nairobi. Data were collected using survey questionnaires, focus group discussions, structured interviews and observations. The survey questionnaire was distributed to 91 physically impaired students and 133 library staff who provided services to visually and physically impaired persons. The interviews were administered to six University Librarians, five Systems Librarians, and five staff from the Disability departments. Furthermore, nine focus group discussions were held comprising of 86 visually impaired persons. The observation checklist was utilised to collect data on the library facilities, as well as the design and layout of the library building. Quantitative data was analysed using Statistical Package for Social Sciences (SPSS) while thematic analysis was used for the qualitative data. For the purposes of this paper, only data collected through survey questionnaires, focus group discussions and interviews is analysed, presented and discussed.

Prior to the commencement of the main study, a pilot study was conducted in one university that was excluded from the main study. The pilot sample constituted 10 percent of the main study sample. The quantitative data from the pilot study was analyzed and Cronbach values of 0.74 for the library staff questionnaire and 0.78 for the questionnaire for the physically impaired persons were generated. The Cronbach values confirmed acceptable level of reliability of the survey questionnair es. Triangulation of different methods of data collection enhanced the validity of the results that were generated. (Yeasmin & Rahman, 2012)

4. Results and Discussions

4.1 Importance of ICT in providing access to information for persons with impairments

The physically impaired persons were required to rate the importance of ICT in enabling access to information. Majority (73, 80.22%) rated ICT as important, 15 (16.48%) rated ICT as moderately important and a minority (3, 3.30%) rated ICT as not important in enabling access to information. The focus group and the interview results confirmed that ICT was very important to the visually impaired persons as it enabled them to become independent in accessing any kind of information with ease as the FGD remarked:

… with ICT most people with visual impairments have been able to access information independently … even without your reader...uum… you know if you are visually impaired you must have a reader especially to access information ....but now that you are able to access them through the NVDA or any other software. You can get to the library at any time and do your own work… you can type, you can copy your own assignment, you can copy your own notes... So it has really impacted on the independence.

The United Nations Educational Scientific and Cultural Organization (UNESCO) (2011) asserts that ICT is very important in supporting high quality education for learners with impairments as it increases their level of independence in carrying out tasks that they were formally not able to perform (Tripathi & Shukla, 2014). Similarly, Thompson (2018) asserts that ICT can enable persons with impairments achieve independent living. Furthermore, the social model of disability advocates for the elimination of barriers that prevent persons with impairments from accessing services (Varney, 2013). Information is one of the services provided by the libraries and ICT plays a critical role in dissemination, access and retrieval of this information.

4.2 Utilization of ICT in libraries to facilitate access to information for persons with impairments

The library staff were asked to indicate how ICT was utilised in the library to enable access to information by the visually and physically impaired persons. The results indicate that 109 (81.95% of the respondents said ICT was used for internet access, 107 (80.45%) indicated that ICT was used for websites, while 97 (72.93%) said ICT was used for OPAC. Other uses of ICT included provision of e-books (93, 69.92%), emailing (92, 69.17%), e-journals (75, 56.39%), and word processing 32 (24.06%) as shown in **Table 1**.

Table 1. Utilization of ICT in Libraries (N=133)

	Frequency (n)	**Percent (%)**
Internet Access	109	81.95
Websites Access	107	80.45
Online Public Access Catalog (OPAC)	97	72.93
E-Books	93	69.92
Emailing	92	69.17
E-journals	75	56.39
Word Processing	32	24.06

ICT resources in the libraries used by persons with disabilities

Similarly, the physically impaired persons were required to indicate the ICT resources that they used in the library. The findings showed 82 (90.11%) of the respondents used internet, 80 (87.91%) used Facebook, 76 (83.52%) used library websites, 74(81.32%) used OPAC, and 72 (79.12%) used emails. Another 65 (71.43%) used e-journals, 63 (69.23%) used institutional repository, 62 (68.13%)

used e-books, and 59 (64.84%) used e-databases as shown in **Table 2**.

Table 2. Use of ICT Based Resources by The Physically Impaired Persons (N=91)

Information Resources	Frequency (n)	Percent (%)
Internet	82	90.11
Facebook	80	87.91
Library websites	76	83.52
Online Public Access Catalog (OPAC)	74	81.32
E-mail	72	79.12
E-journals	65	71.43
Institutional Repository	63	69.23
E-books	62	68.13
E-databases	59	64.84

These findings were corroborated by interviews with the University Librarians and the Systems Librarians. Moreover, some focus groups stated that the visually impaired persons also used WhatsApp, twitter and Facebook as one of them stated:

> *Uum…using the screen readers software we read e-books, e-journals, we read and s end emails, we chat with WhatsApp and Facebook,…Uuum.. we type our work and print it in braille or send it tour lectures by email.*

A similar study conducted in Turkish universities by Ari and Inan (2010) revealed that students with impairments mostly used technology for typing and doing research (19, 80%) each, surfing the internet (17, 77%) and emailing as well as instant messaging (13, 59%) each. Other uses included accessing e-resources, listening to music and watching films.

The current study revealed that most university libraries did not have the necessary assistive technology and devices to enable the visually and physically impaired persons to access and use ICT information resources. This result is similar to a study conducted in Ghana by Ayiah (2017) which revealed that students with visual impairments could not access relevant information owing to the lack of the necessary assistive technologies.

Article 21 of the UN CRPD requires that state parties to ensure that persons with impairments “can exercise the right to freedom of expression and opinion, including the freedom to seek, receive and impart information on equal basis with others through all forms of communication of their choice” (United Nations, 2008). Article 54 (b) of the Constitution of Kenya 2010 has made it clear that persons with disabilities are entitled to access the educational institutions and facilities suitable to their their needs. Further, Article 54 (e) states that persons with impairments are entitled to access materials and devices that would enable them overcome any constraints arising from their disabilities (Republic of Kenya, 2010).

This can only be achieved through ensuring that the information intended for the general public is provided in accessible formats and technologies suitable to persons with various types of impairments without extra cost, as well as promoting the use of sign language, braille and more.

4.3 Assistive technologies and devices provided by the library for persons with impairments

The library staff were asked to indicate the assistive technology and devices provided for persons with impairments. The findings revealed that the major assistive technology and devices provided by the libraries included scanners (75, 56.39%) and screen magnifiers (74, 55.64%). Other technologies and devices included screen readers (57, 42.86%), Braille embossers (51, 38.35%) as well as Braille translation software (44, 33.08%). The least provided assistive technology and devices include Manual and motorised wheelchairs, voice recognition software and CCTV magnifiers as shown in **Table 3**.

Table 3. Assistive Technologies and Devices Provided by Library (N=133)

	Frequency (n)	**Percent (%)**
Scanners	75	56.39
Screen Magnifier	74	55.64
Screen Reader	57	42.86
Braille Embosser	51	38.35
Braille Translation Software	44	33.08
Walkers for Physically Impaired	19	14.29
Motorized Wheelchairs	3	2.26
CCTV	2	1.50
Voice Recognition Software	2	1.50
Manual wheelchairs	2	1.50

This was collaborated by the focus group discussions, the interviews with the university librarians and the systems librarians as one of the systems librarians observed:

> *The library has acquired JAWs screen reading software, MAGIC screen reading soft ware, NVDA screen reading software, computers, Duxbury braille translation softwar e, Braille embosser for printing braille, Scanner for converting print to soft copy, F ilm strips, slide projectors, headphones… radio for recording.*

However, the interviews conducted with the university librarians as well as the staff from the disability department revealed that the libraries did not provide manual and motorized wheelchairs. The disability departments however, provided manual wheelchairs and other facilities such as white canes, and crutches on a lending basis to students with impairments who did not have their own as staff from the disability departments remarked:

… the chairs, the wheelchairs, uum… the white canes those have of course gone th ey are not here they are being used. They have crutches, uum… shoulder crutches, arm crutches all those…. What we do with these ones we don't give them out. We lend…. We lend students so that as they prepare to get their own, they can still be mobile.

4.4 Challenges and amelioration strategies relating to access to information for persons with impairments

Among the six libraries that were studied, only two libraries were well equipped with the necessary assistive technology and devices including NVDA JAWS, CCTVs, Braille machines, braille embossers, and Thunder. Others included Dolphin Pen, recorders, slate and stylus headphones, reading stand, microphones, scanner, Mercury, adapted rulers, telescopes, magnification lenses, and cameras. Two of the remaining four libraries had screen readers only while one had braille machine only. However, one library had no assistive technology and devices.

Asked whether the library catalog was equipped with text enlargement and voice recognition software, most of the library staff (97, 72.93%) stated that the OPACs were not equipped with text enlargement and voice recognition software. A small percentage (36, 27.07%) of the respondents stated that their Library OPACs were equipped with the said software. A study conducted in Nigeria by Uzohue and Yaya (2016) revealed that students at Pacelli School for the blind faced challenges of inadequate computers, assistive technologies, and inadequate trained librarians among others. Various related studies conducted in libraries serving persons with impairments revealed that the libraries lacked the necessary assistive technology and devices to enable persons with impairments to access and use information (Abdelrahman, 2016; Dodamani & Dodamani, 2019; Githinji, 2013; Munemo & Tom, 2013; Kadodo, Rugara & Ndinde, 2016; Todaro, 2005). Grassi (2017) asserts that assistive technologies are valuable investments in libraries whose main goal is to improve access to those technologies as well as accessibility to information. Moreover, accessible technologies such as computer operating systems, web browsers, screen reading and magnification equipment as well as touch screen devices can help enhance library use by persons with impairments.

The respondents surveyed proffered several suggestions on how libraries could try and address the challenges of accessing information in libraries for persons with disabilities. These suggestions included but were not limited to: formulation of ICT policy to guide provision of ICT services to persons with impairments; increasing the internet bandwidth; installing power back up system; acquiring the required assistive technology and devices; training staff in the use of assistive technology in order for them to be able to assist persons with impairments; increasing the number of computer for use by persons with impairments; equipping library staff with ICT skills so that they can be efficient in assisting the visually and physically impaired persons; and acquiring compatible software to replace the outdated one.

5. Conclusion and recommendations

The authors sought to examine in this article, the information communication technology (ICT) use for information access by the visually and physically impaired persons in public university libraries in Kenya. They endeavored to find out how ICT was applied to facilitate access and use of information by visually and physically impaired persons; to assess the assistive technology and devices provided by libraries for visually and physically impaired persons; and to find out the ICT challenges facing libraries in providing ICT services to the visually and physically impaired persons and proffer solution to those challenges.

The findings revealed that while libraries were making efforts to provide information resources in electronic formats such as internet, websites, OPAC, e-databases, e-books, and institutional repository and more, access to these information resources was hampered by lack of assistive technology and devices. Consequently, the persons with disabilities were excluded from accessing and using ICT and information services.

Public universities in Kenya rely largely on government funding. However, over the years, the universities have witnessed dwindling funding which has impacted a lot on programs and projects. With inadequate university funding, libraries have had myriad of challenges ranging from inadequate information resources, inadequate training programs for staff, to inability to support programs and service for persons with impairments. Most libraries cannot afford basic assistive technology and devices. This coupled with lack of disability policy frameworks in the libraries can really be a major drawback in addressing the information needs of persons with disabilities as libraries result to break-fix services. Programs and services for persons with impairments should be proactively designed to promote inclusion as well as fostering a sense of appreciation and belonging amongst persons with impairments. An inclusive information society demands that all people without distinction and irrespective of their physical (dis)abilities must be enabled to function and benefit from the digital dividends occasioned by advancements in information and communication technologies.

The authors therefore recommend among other things improving assistive technology infrastructure. Further, university libraries need to embrace new assistive technologies such as telepresence robots, virtual realities and more in providing information services to persons with impairments. Additionally, the libraries need to put in place enabling policies and capacity building programmes to enable library staff to effectively offer information services to the visually and physically impaired persons. The IFLA Checklist and the Social Model of disability provide important guidelines that can guide libraries in offering an effective library and information service to persons with impairments. For this to happen, adequate budget must be provided to cater for the special needs of persons with impairments.

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