INFORMATION SEEKING BEHAVIOUR ON DIGITAL RESOURCES BY VISUALLY IMPAIRED STUDENTS AT THE UNIVERSITY OF NAIROBI LIBRARY, KENYA.

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RESEARCH THESIS SUBMITTED TO THE SCHOOL OF PURE, APPLIED AND HEALTH SCIENCES DEPARTMENT OF COMPUTING AND INFORMATION SCIENCES, IN PARTIAL FULFILMENT OF THE REQUIREMENT FOR THE AWARD OF THE OF MASTER OF SCIENCE DEGREE IN INFORMATION SCIENCES.

MAASAI MARA UNIVERSITY

NOVEMBER, 2021

DECLARATION

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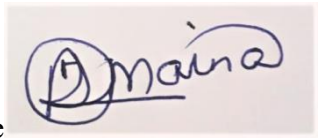
Signature  Date……..…

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I dedicate this work to my dear Husband Parmuat Ole Purkei, my son Meitamei and my daughters Mayian, Nailantei and Naitore.

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Finally, My sincere appreciation to all my respondents in this study whose anonymity I respect.

ABSTRACT

Information is power, a very important and valuable commodity in everyday human activity as evidenced with the current digital divide that equal access to information is essential to the development of information society which also applies to people with disability. The aim of the study was establish the information seeking behaviour of visually impaired students in accessing digital information resources with special reference to University of Nairobi library services. The study was guided by the following objectives; to: establish information seeking behaviour by students with visual impairment in accessing digital resources; determine how existing adaptive and assistive technology impact students with visual impairment in accessing digital information resources; identify the challenges that mitigate the visually impaired students when accessing the digital resources and to propose possible strategies to mitigate the challenges that VI students face while accessing the digital resources. The total population of the study comprised of two units of analysis which were 32 visually impaired students and 6 librarians in charge of the visually impaired students. The study carried out a survey by means of questionnaires and observation protocol. The researcher observed keenly the behaviour of the VI students on how they interact with the adaptive/assistive technology; how they seek the information and challenges to its accessibility. This was achieved through the use of observation protocol instrument. The observation results were to complement questionnaires from both the digital librarians and the VI students. The study employed Wilson's (1999) Theory of Information Behaviour Model which provided a framework in mapping the student's information patterns. SPSS version 25 was used to analyse the data. The response rate was 78.95% from all the units of analysis. The results indicated that majority 72% were female. Similarly, the results revealed that most VI students were getting assistance from a sighted person or by use of computers, speech synthesizers, screen readers, brail prints, and audio books. The study revealed that a smaller number used mobile app called Tap Tap. The findings also indicated that UON library had digital resources for VI which were inadequate. Although most of the VI students had attended training or workshops, they faced several challenges which include; limited number of learning materials, slowness of VI students in grasping/typing information, inadequate electronic knowledge and skills from the librarians, negative attitude from their peers, financial challenges, inadequate digital skills by VI students, small learning space, failure to see facial expressions, mobility problems, and poor network. The study recommends that; the number of braille machines/learning materials/digital resources for students be increased, that the university have a continuous training on the existing librarians so as to equip them with enough and current technological skills, and ensure that the study environment is adaptive for VI students. The study further recommends that this being a grey area, more research needs to be carried in other public universities handling visually impaired students.

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LIST OF ABBREVIATIONS AND ACRONYMS

AT	-	Assistive technology
ASK	-	Anomalous State of Knowledge
DE	-	Distance Education
DR	-	Digital Resources
ER	-	Electronic resources
IR	-	Institutional repository
ICT	-	Information Communication Technology
IT	-	Information technology
JAWS	-	Job Access with speech
JKML	-	Jomo Kenyatta Memorial Library
SPSS	-	Statistical Package for the Social Sciences
UON	-	University of Nairobi
VI	-	Visually Impaired
VIS	-	Visually Impaired Student
UDSM	-	University of Dares Salaam
EBSCO	-	Elton B. Stephens Company.
JSTOR	-	Journal Storage
PDF	-	Portable Document Format
VIUs	-	Visually Impaired Users
KPs	-	Knowledge Providers
SPs	-	Service Providers
IPA	-	Interpretative Phenomenological Analysis
COVID-19	-	Coronavirus Disease
BVI	-	Blindness or Vision Impairment
DLs	-	Digital Libraries

CHAPTER ONE

INTRODUCTION

1.1 Background Information

A growing number of countries have recognized the high potential of information to contribute to national economic and social development. As Kenyans development enters a new stage of being digital, it also requires an updated 'information' strategy for its economic and social transformation. Information is a vital commodity, as it has the very basis of human existence. The modern society depends fully on information and therefore when the information is utilized effectively it brings growth and wealth to the development of the society. Library users are in general key founders to information seeking with the post war that increased the scientific literature that was recently released or newly published from war-time restrictions led, in 1948, to the Royal Society Scientific Information Conference (1948), was the beginning of the modern study to information seeking behaviour by the human beings (Mierzecka-Szczepanska, 2015). However, the subject goes rather further back in time.

In today's world there has been a rapid and tremendous change in the world of digital technology, that is to say that the way of acquiring data have dramatically transformed due to compelling reasons like rapid transformation in the knowledge of computer and international network (internet) which for that matter is mushrooming daily.

Even though digital resources give out creativity non-changeable choices in the order of price and time, other individuals are still adhering to printed resources. Previously, the most suitable and preferred method of resources academic researchers was print outs resources. Presently, quite a number of resources for example encyclopaedias,

books, theses, scientific articles and open access electronic databases in digital media (Ongoz & Baki, 2010). In today's world, however, the data and information systems and also the internet has gained a very big popularity as a worldwide avenue and channels for information propulsion due to its ability to incorporate global gathering of information (Ekwelem, 2013)

Information is needed to all and this modern world has been termed as the period of knowledge or information provision whereby the information is provided in different format (Ortlieb, 2014)

Taking into consideration the flourishment works in archtecturing repositories, portals, intranets, information and collection encouraging the utilization of web 2.0 discipline, which allows anyone to create and share any electronic information or materials they have created, it may appear to line interests to control that content is available to all, Concerns to design accessible web pages for visually impaired users should especially be taken into consideration (Kleynhans & Fourie, 2014).

Lack of visual ability can prevent people with vision problems from coding precise vital information, particularly print documents that require extensive navigation to access or read. Lucky and Achebe (2013) with an informed society, more people with disabilities are not left behind; they also enrol in institutions of higher learning to equip themselves with knowledge. In this case, it is the responsibility of library management to provide the same range of information to users with challenges, regardless of format; this implies that access to information should be equal for all categories of users (Ekwelem, 2013). Conversely, equal access to digital information resources will be available for the betterment of the disadvantaged group. The appropriate information material in electronic format should be made available and in

large variety (Craven, 2011) The library management should be at the forefront in acting upon the needs of the students with disabilities by making the resources comprehensive and need to listen to their voices and continuously improving their services (King & Coetzee, 2018).

Libraries are service institutions that provide services to all of their customers, including the sighted and the visually impaired. Libraries should have a sufficient number of digital materials that are beneficial to the disadvantaged. People with disabilities are frequently aware of the most recent technologies/equipment and focus on training to maximize their benefits (Brown, 2008). The development of assistive and adaptable technologies has increased the opportunity for disabled people to rapidly transform their way of life in the most flourishing, efficient, and result-oriented way (Academia de Studii Economice (Romania & Shah, 2017). The advancement of technology in information access, assistive and adaptive technology is a crucial tool for visually impaired students in accessing digital resources, which library management should examine and factor in when developing library policies (Kiambati, 2015). When institutions of higher learning consider and expand library resources for the visually impaired, their education will be on par with that of the sighted group, given that access to digital resources is well supported by assistive technology.

The University of Nairobi is a higher education institution located in Nairobi County, in the heart of Nairobi, Kenya's capital city, along University Way. The institute was founded in the 1970s and letter. The outstanding library was built in the 1980s with the immense or rapid growth another library was born that was primarily established for the sake of postgraduate students this was the well-known Gandhi memorial library, which provides its services to the college of humanities, architecture, social

sciences, and engineering students. With an annual enrolment of 60,000 students, the main UON library can accommodate around 2,500 learners at a moment, with 160 librarians working in all sections of the library (Commission for Higher Education, 2008).

The library is considered among the biggest academic library the country have. Its coverage includes both print and electronic resources; among them are e-books-thesis, electronic past papers e- journals etc. with the changing technology the library have also embraced change whereby it has fast forward the digitization of library collection among them are the local content that are obtained within the institution, this local content provides a platform for the ranking of institution some of these include the Institution, electronic past examinations, undergraduate e-projects, electronic thesis and electronic journal articles. Moreover, the library also factored in the establishment of sections that enable the students with hearing, visual and physical disability, this indicates that the library has enhanced equal access to information resources regardless of any challenges library user might have. The library being a sole giver to information, thus it is necessary to establish the information seeking behaviour of visually impaired students in accessing digital information resources.

1.2 Statement of the problem

The University of Nairobi was recognized as one of the best academic universities in Kenya by UniRank (2020), providing large current knowledge resources using the most advanced technology available. It has not only examined users' ability to remotely access these information resources, but has also enabled them to access them online. The university has a diverse user base and has been at the forefront of extending their services to visually impaired individuals. It has facilitated the utilization of digital resources for the VI by implementing assistive technology. This

technology is specifically designed to help the VI student gain access to digital information resources. Kiruki (2018) investigated the information provision services to library users with visual and physical impairments in seven (7) Kenyan public universities. Among them, the University of Nairobi, but only looked at print information resources used by visually impaired students, with a focus on policies, information services, information communication technology (ICT), library staff attitude, and the design and layout of the library building. Kiambati (2015) investigated the difficulties that visually challenged students have while obtaining information, with a focus on e- resources. Studies on VI students' information seeking behaviours are scarce, and no studies on VI students' information seeking behaviour have been established at the University of Nairobi. As a result, the purpose of this study was to determine information seeking behaviour on digital resources by visually impaired students at The University of Nairobi library services, as well as to provide potential solutions for full use of digital resources.

1.3 Aim of the study

The main aim of this study was to establish the information seeking behaviour of visually impaired students in accessing digital information resources within university of Nairobi library.

1.3.1 Specific Objectives

The following were the specific objectives of the study; to:

- Establish information seeking behaviour on access to digital resources by students with visual impairment.
- Determine how existing assistive technology impact students with visual impairment in accessing digital information resources.

- Identify the challenges faced by the visually impaired students (VIS) when accessing the digital resources.
- Propose possible strategies to mitigate the challenges that VI students face while accessing the digital resources.

1.4 Research questions

- How does information seeking behaviour of students with visual impairment does affects access to digital information resources?
- How do assistive technology affect students with visual impairment in access to digital information resources?
- What challenges do students with visual impairment face in accessing digital information resources?
- What should be done to mitigate the challenges that VI students face in accessing digital resources?

1.5 Justification of the study

This research focused on VI students' information seeking behaviour. Information seeking is vitally important in everyone's existence, both for the VI and the Sighted. In today's world, there has been a rapid and tremendous change in the world of digital technology, which means that the way of acquiring data has dramatically changed due to compelling reasons such as rapid changes in computer knowledge and the international network (internet), which is mushrooming on a daily basis. According to Kiambati (2015), visually challenged pupils confront numerous problems when obtaining information on electronic resources. This suggests that until these issues are solved, VI students are likely to experience additional obstacles even if education reforms are implemented and totally changed to digital learning. In reality, as

technology has advanced, the library has welcomed change and has accelerated the digitization of library collections, including local content obtained within the institution. Furthermore, the library established sections for students with hearing, visual, and physical disabilities, indicating that the library promotes equal access to information resources regardless of the problems that library users may face. As a result, the study helped to close the gap in VI students' information seeking behaviour when it came to digital information.

The research was carried out at the University of Nairobi Library, which is one of the country's largest academic libraries. In addition, it covers a wide range of print and internet materials.

1.6 Significance of the study

It is hoped that this study would provide an insight to the team governing libraries and other information centres to take comprehensive judgment in the development of organization that provide digital information resources and more especially to the changing world of digitization.

The library users who are visually impaired would be able to gain from the study, this is because the outcome of the study will create a platform for suggestions or possible solutions to the pinpointed problems which would lead to an informed library user in meeting their information needs.

The study would form a platform for researchers and scholars to have critics and more investigation as well more realization to the upcoming researchers in the field of information sciences.

The study will also steer the government and key ministries that assist visually impaired students to upgrade facilities and infrastructure in order to provide a more suitable learning environment.

1.7 Assumptions of the study

The following were the assumption that guided the research, that:

1. Visually impaired students use digital resources.
2. The visually impaired students face some challenges in accessing digital resources.
3. Assistive technology in university of Nairobi library affects the retrieval and access to digital resources.

1.8 Limitations of the study

The findings from the study could not be generalized to entire population in Kenya due to the fact that it was only limited to UON library users who were specifically visually impaired.

The research study was biased against sighted library users and had special focus to the visually impaired students at UON library.

1.9 Definition of terms

Accessibility

It refers to the simplicity with which a library user, researcher, academician, or student can visit any given information Centre and have access to its online resources or any digital material, use the resource, and obtain any given information in any format.

Adaptive technology

It refers to a special device with a digital version of an existing technology that gears in enhancing or supporting persons with disability to navigate the system effectively in attaining or accomplishing their day-to-day activities or a task, an example of adaptive technology includes large monitors, digitized text etc.

Electronic Resource

Electronic resource refers to any information materials that can be accessed by means of a computer with internet support. It is always important that the electronic resources retrieved from the system are saved in gadgets such as flash disks, compact disk or hard disk for future use. Examples of an electronic resource are the subscribed journals, electronic newspapers, e- books etc.

Digital resources

It can be defined as information materials that have been created and processed in digital form or an analog material that have been converted to digital format, moreover the digital information must be scanned or accessed by means of an electronic media stored locally or remotely in a computer.

Disability

Disability is an impairment or a condition that makes someone or somebody difficult to interact with environment this impairment is the problem that the body might have or it makes it difficult to execute an activity in a life situation. Disability hinders someone in achieving a task.

Information Behaviour

Information behaviour is defined as individual action to search information to satisfy a need, it clearly indicates how people approach a problem towards accessing the

relevant information, and it basically shows how information users conduct themselves in processing, searching and retrieving a resource. According to Wilson 2016, information behaviour is referred to as an active or passive seeking for information it can be either face to face or watching the television, without any action to interrogate it.

Information seeking behaviour

Information seeking behaviour is defined as an active searching for an information to satisfy a need, for someone to seek information there must be a need or a problem statement and this indicates that the gap needs to be filled as an information seeker u try to feel the gap of knowledge. Information seeking behaviour is a continuous approach to information whereby when the gap is not filled the process begins a fresh. It's a purposive searching for information.

Information need

A need starts from an individual with a motive to fill a gap, therefore information need refers to a process of locating, searching, accessing and retrieval of information towards solving a problem, it always begins by an urge to fill the breach of knowledge, it's a term mostly used by information scientist.

Information seeking

It's an engagement of a library user in interacting with the system to obtain or retrieve information towards achieving a certain goal it is referred to as an intellectual processing in solving a problem. This term information seeking basically means searching and locating a resource in all aspects of knowledge, it's a human behaviour that for one to search for information there must be a need or problem that need to be investigated or established.

Special needs students

Everybody has a right to information regardless of any challenge or condition, therefore special need students refer to an individual with difficulty in accessing or retrieving information, and therefore for a special need student he/she will requires special attention and specific necessity to address a problem, the special need might me mental. Emotional or physical.

Visual impairment

Visual impairment is defined as a decreased or incomplete ability to see objects or movements, it's a condition that someone can be born with or a disorder that can lead to blindness or impairment. In this case the researcher will refer visual impairment to imply for both blind and partially sighted as long as an adaptive technology is used to access the digital resources.

Visual Impairment Student

Visual impairment student is defined as a learner with decreased or complete ability not to see objects or movements, it's a condition that someone can be born with or a disorder that can lead to blindness or impairment. Students with vision impairments experience challenge to impact with the system in learning, and therefore there must be a necessity for the support equipment that suit the needs.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

Review of the literature stipulate the structure or the framework in establishing the importance or the significance of the study and more so to compare the results with other finding (Creswell, 2015). It forms a text that intent to review a critical text concerning a specific topic. It also presents a review of related literature and both theoretical framework and conceptual framework that will guide the study, hence the study reviewed the following sub themes.

2.2 Theoretical framework

Theoretical framework is an anticipated point of view that guided the study and raised interrogation that is expected to be dealt with.

2.2.1 Wilson's 1999 Model of information seeking behaviour

The study was guided by Wilson's Model of Information Seeking Behaviour. This model pinpoints the need to search information seeking in context. The model permits people to be conceptualized as one entity, which suits the setting of the concept in the disability group. Wilson (1999) has come out with different models of information behaviour for so many years. For example, from 1981 to 1999, his information behaviour models show that different factors bring about specific information needs. Wilson's (1999) Information Behaviour Model carefully studies patrons from the perspective of their information need, information seeking and information behaviour. Wilson's (1999) Model was therefore used as a framework for the study as it allowed description and clarification of user information behaviour. The study found the model to be more appropriate to the population under study than other models.

According to Niedzwiedzka (2003), Wilson proposes that “information needs are secondary needs caused by primary needs which in accordance with definitions in psychology can be defined as physiological, cognitive or affective”. Cognitive needs arise in an effort to find sense and order in the world. The growth of a specific need is influenced by the setting, which can be the person himself/herself, or his position in the work place. Uniqueness of individuals strongly controls the information behaviour of a person. Personality of an individual affect the choice of information needs. Information needs of a lecturer may be different from that of a post graduate student and the needs of the same person may differ depending on the variations in circumstances.

The role a person plays in life is the result of the behaviour patterns displayed in society for the specific role. Therefore, a lecturer, a student or a father has some specific duties which are related with their occupied positions and job description. The Wilson’s (1999) model (**Figure 2.1**) portrays information seeking behaviour arising as a result of a need, which dates back to Belkin’s (1982) “Anomalous State of Knowledge” (ASK) approach which presupposes the existence of a “gap‟ in the knowledge base of the user which needs to be filled by information. In order to satisfy that need, in Wilson’s (1999) words, the “user makes demands upon formal or informal information sources or services, resulting in success or failure to find relevant information. If successful, the user can make use of the information found but if the information found failed to satisfy the need, the user has to repeat the search process”.

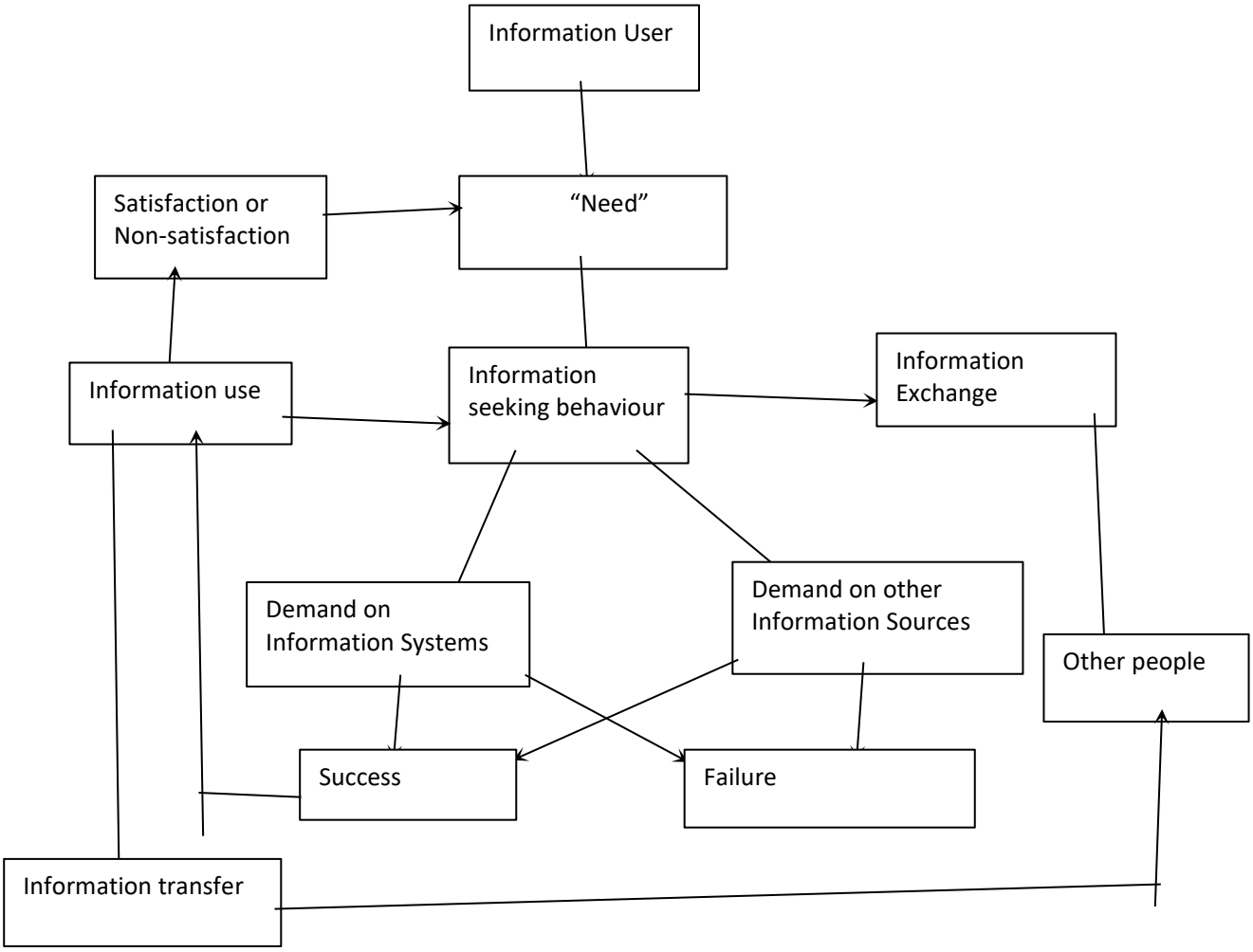

Figure 2. 1: Information seeking behaviour model

Source: Wilson, T.D. (1999). Information needs and uses: fifty years of progress

2.3 Conceptual Framework

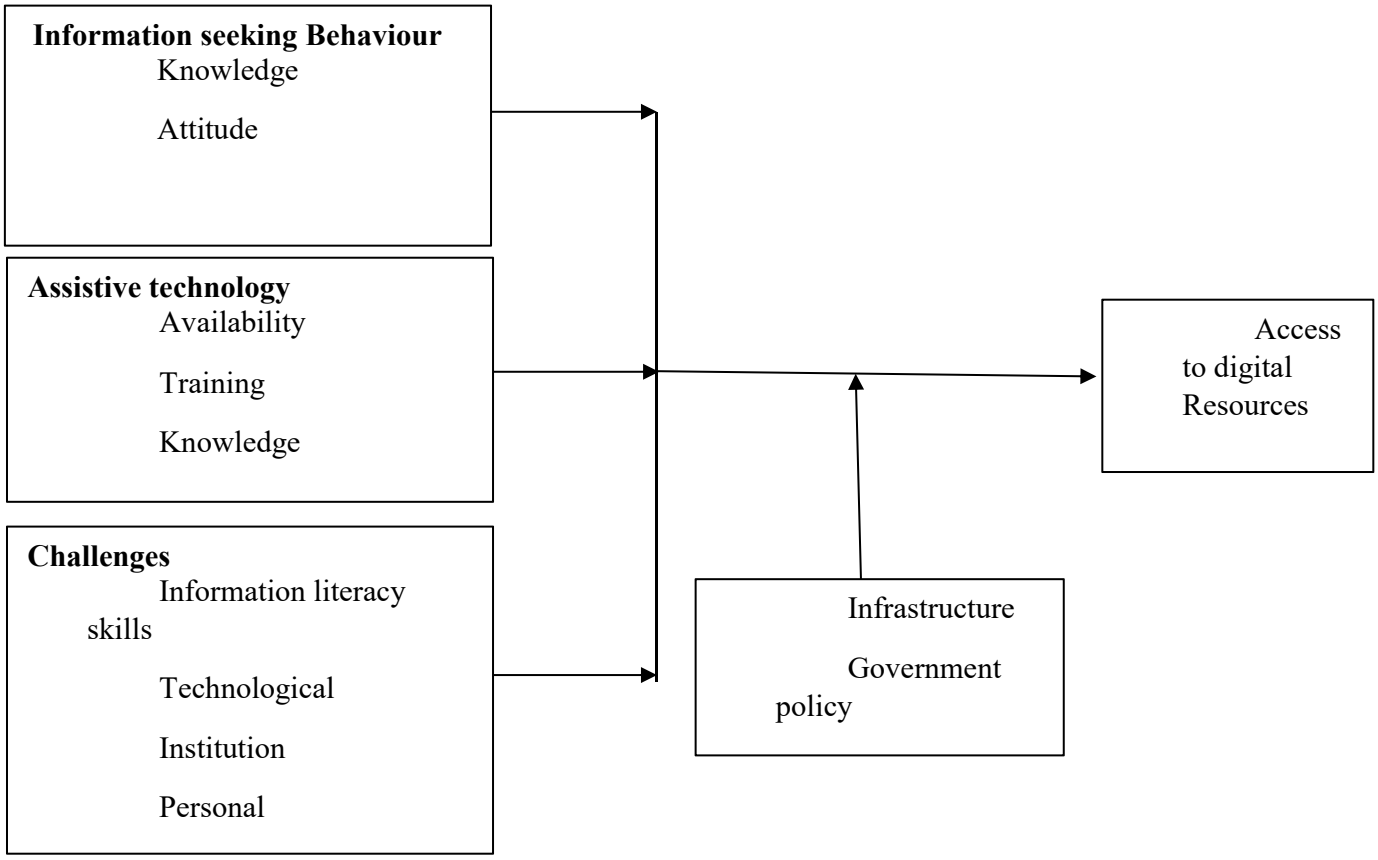

Figure 2. 2: Conceptual framework

Source: Researcher, 2021

2.4 Information seeking behaviour

Information seeking takes place when a person recognizes a gap that needs to be filled by acquiring new information. Wilson (2016) states that "information-seeking behaviour is the purposive seeking of information as a consequence of a need to satisfy some goals". When searching information, individuals or researcher may relate with information systems like library and computer-based systems such as the World Wide Web. In daily events or activities of humans, people need information to

support them take decisions concerning their lives and businesses, careers and so on. This implies that individuals need information in their daily life. Case (2016) defines information seeking as “a conscious effort to acquire information in response to a need or gap in one’s knowledge”. During the information seeking process, several factors are at play such as recognizing, selecting and finding a possible information provider that will satisfy the information needs of that particular person. According to Pettigrew (1996), information seeking behaviour involves personal reasons for seeking information, the kinds of information required as well as ways and means of finding it. In all the definitions, an emphasis is on a crucial drive. Case (2012) further states that information seeking is everywhere in human activities, whether gathering data for work, making sense of everyday life or looking for information is a basic behaviour that shapes the lives of people.

Appiah, (2017), Saumure and Given (2004) as cited in (Dermody, 2011) signal that information search behaviour of students with visual impairment needed extra period to ascertain the material is reachable. Samure and Givens, (2004) study point out that they had to go back to their disability office to ensure the article or book was get-at-able, and so they relied on their librarians, counsellors, friends so as to obtain the relevant information materials. Hence the VI students lacked freedom in their information seeking behaviour. The study also signal that they looked for readily available resources on the internet. Relying on in hand information reduced the quantity of resources they could have used for their research (Dermody, 2011).

A study conducted by Beverly, Bath, and Barber (2011) examined the wellness and social care information needs of people with visual impairment. The study stated that visually challenged people need are varied due to their condition. Also, the study

revealed that not all their needs were being met by information providers at the hospital and eye clinic department. Information providers did not deliver information in the person's preferred format. Beverly, Bath, and Barber (2007) provided a valuable understanding into the information behaviour of visually challenged people by testing the particular and worldwide information model to the information behaviour of visually challenged people seeking health and social care information. The results were that Moore's (2002) and Wilson's (1999) models provided a suitable outline for analysing and accepting the information needs and information behaviour of visually challenged people in relation to health and social care information. Moreover, the study emphasized the significance of creating conducive atmosphere and adopting mutual understanding to allow people to seek and obtain the required information. Craven (2003) conducted a study on the information seeking behaviour of visually challenged people with web-based resources. Twenty sighted and twenty visually challenged people were used as a sample size. The users used different information seeking tasks and online resources. The outcome was that visually challenged users spend more time to do searching online. The kind of devices used also had an influence on the search process because a well sophisticated equipment offers the user a more flexible approach to searching. (Chang & Chang, 2010). Barriers that hinder information seeking were summarized into four categories: individual disability, human relations problem(s), deficiency of information media (e.g., audio materials, the Internet and text files) and environmental limitation(s). Chang and Chang (2010) found that respondents mainly used libraries to meet their daily life information needs and the deficiency or lack of proper media was identified as the most common obstacle in gaining needed information.

Klinkosz, Sekowski and Brambring (2006) compared academic achievement and personality traits influencing academic grades of sighted and visually impaired students at Polish universities. A group of 105 visually impaired students (37 blind and 68 with low vision) were selected based on psycho-educational criterion of successful graduation from school. Two short personality questionnaires to measure neuroticism, extraversion, openness, agreeableness and conscientiousness and the Delta Questionnaire for Measuring Locus of Control were administered. The study established that, although academic achievements of visually impaired students were equal to those of their sighted fellow students, both demonstrated greater social and emotional maturity and were strongly guided by their beliefs. The study permitted that the level of academic achievement of the blind students and those with low vision were connected in varying degrees. It further showed that all the students with visual disability coped well with their studies and passed their examinations on time. They all viewed a university education, the acquisition of knowledge and vocational skills as forms of self-realization. Shaver (2011) describes five ways and techniques to ensure that a website is accessible to the visually impaired, emphasized the inclusion of enlarged text, contrasts, colours for action items, desktop users to browse mobile sites and keyboard shortcuts to aid navigation. Van Puffelen (2009) examined the Information Communication Technology (ICT) related skills and requirements of blind and visually impaired people. The target groups of the study were young from 10-14 years and elderly 55 and above people. The study showed that young visually impaired users needed ICT skills to communicate with others and also for their educational prospects. For elderly visually disabled persons, ICT skills were important to get and stay in touch with peer groups, government institutions, and with services related to their disabilities. Solarin (2012) attempted a survey to know the

library and information services available for physically challenged students in academic libraries in Ogun State, Nigeria. The creator of the content found that the physically challenged users were not adequately taken care of in institutions of higher learning.

Lucky and Achebe (2013) also investigated the delivery of information services to the visually impaired users provided by the Hope for the Blind Foundation Wusasa, Zaria (Nigeria). The study showed that people of visual impairment had no opportunities to access information specially which was in print form. Though, information and communication technology had been found very significant to solve the problem. Ndumbaro (2019) investigated the attitude of library staff towards people with visual impairment in university and public libraries in Tanzania, with regard to the provision of library and information services. The study employed both qualitative and quantitative research approaches. The study population was randomly and purposively selected; and involved patrons with visual impairment, library staff, library directors, readers for people with visual impairment, institutions associated with people with visual impairment. Snowball techniques were used to select library users with visual impairment and readers for users with visual impairment. The findings revealed that the attitude of library staff towards people with visual impairment was positive.

Koustriava and Papadopoulos (2014) examined the attitudes of individuals with visual impairments towards distance education (DE). The study targeted 41 participants of 20-40yrs. A self-constructed questionnaire was employed. The study revealed that the sample of individuals with visual impairments had slightly positive attitudes towards DE due to insufficient technological devices. Age, level of education, and frequency

of computer usage were found to be significant predictors of the participants' attitudes. The current study employed semi structured questionnaires and observations to obtain data. Yu (2017), Conducted a study on the information needs and information seeking behaviour of visually impaired students in China. Two ways of data collection were employed: a telephone survey with a questionnaire in the first round; fieldwork and face-to-face interviews with a semi-structured topic guide in the second round. The study employed descriptive analysis and qualitative content analysis. He employed Chatman's small world theory. The information needs of the visually impaired were focusing on real life problems. Broadcast media, people and networked source satisfied most of their needs. The study found out that a small world life affects the information behaviour of the visually impaired and constructs meaning in it.

Kabogolo (2020), Conducted a study to examine the information-seeking behaviour of visually impaired students (VIS) at the University of Dares Salaam (UDSM). The study sought to determine information needs of VIS at UDSM and find out whether information sources used by visually impaired students meet their academic-related information needs. The study employed a qualitative research approach. Census sampling technique was used to obtain twenty-five VIS to participate in the study. Data were collected through semi-structured interviews, observations and documentary reviews. Data were analysed using thematic data analysis method. The studies found out that visually impaired students' information-seeking behaviours vary from one student to another due to differences in their sight disabilities.

2.5 Adaptive and assistive technology

When Adaptive or assistive technology are in place persons with disabilities will perform their daily activities independently with no assistance from librarians or peers,

enabling persons with disabilities to perform tasks they were formally unable to accomplish.

According to the proposed Assistive Technology Act of 1998, assistive or adaptive technology is a product, device, or equipment, whether purchased commercially, modified, or customized, that is used to preserve, increase, or improve the functional capabilities of individuals with disabilities. The products enable people with disabilities to accomplish day-to-day living responsibilities, it aids in communication, education, work, or recreation activities, and it enhances quality of life (United States, 2004).

Extensive range of constantly developing assistive or adaptive technology devices exist to support visual impairment. These devices and tools enable visually impaired students to perform sight-related tasks independently (Tinerella & Dick, 2005) and may include screen magnifiers- used to enlarge and change colours on the screen to improve the visual readability of rendered text and images, screen readers- used to read textual information through synthesized speech or Braille displays, voice recognition software-used to simulate the keyboard, alternative pointing devices -used to simulate mouse pointing and button activation and Braille readers.

The computer-related aids and equipment for visually impaired are commonly known as “assistive,” “adaptive,” “access,” or “enabling” technology. Often people will use a combination of the above technologies to enable them to read electronic print (Brophy & Craven, 2007).

A study carried out in Canada by (Dermody & Majekodunmi, 2011) established out that technology has opened doors for students with disabilities. They noted that from screen readers to augmentative communication programs, individuals with disabilities can attend lessons, contribute in discussions and read and write assignments

independently. Nevertheless, the study also showed that technology can also be an obstacle. For example, the advancement in Web 2.0 and the new virtual learning environment do not always take into consideration whether or not it is compatible with the assistive technology students rely on (Dermody & Majekodunmi, 2011).

According to (Brophy & Craven, 2014), "design for all" in a library environment basically means that library information technology (IT) systems and interfaces must be designed in a way that supports reading and interacts easily by library users, regardless of disability or access preference, whether they are physically visiting the library or accessing it remotely. Different visually impaired people require different technologies due to their various impairments (Kleynhans, 2009).

In a library set up, Assistive technology may be as simple as a magnifying glass or it can also be sophisticated as a computer workstation with software which can facilitate user with disabilities to scan a book and hear it read loud followed with highlighted text on a monitor screen. Likewise, libraries can add workstations configured according to the needs of the specific user groups like provision of speech recognition software for the blind to control the computer or enter the text via their voices, the touch screen monitor and electronic tracking device for those who can't make use of standard keyboards. Libraries can create effective assistive technology programs that enhance better solutions in providing access to the library resources and the services (Ahmad, 2014).

The accessible workstation allows customers to adjust the height of the worktable and includes a movable arm for mounting the monitor so that users can tilt the display as required. An ergonomic keyboard tray and a large monitor around 20 inches or larger can also be part of the workstation which allows patrons using screen-enlarging software to see more of the displayed text while moving through the documents

(Mates, 2010,). Well planned technological solutions and access points based on the concepts of universal design are essential for the effective use of information and other library services by all people.

According to (American Library Association, 2001). Information can be provided to the persons with disabilities if libraries can make necessary arrangements to providing computing environments to users for maximum utilization of electronically published materials regardless of their capabilities. There are many technological innovations taking place for the persons with disabilities, therefore, librarians need to explore how persons with disabilities use computer technology and what issues involved in using this technology for accessing the electronic information (Berliss, 1994).

The analysed literature demonstrates that assistive technology considerably expands and promotes information access for the disabled; yet, librarians face a significant barrier in selecting appropriate adaptive or assistive technology for libraries from the thousands of resources accessible today. Consequently, librarians should make necessary deliberations before accepting these technologies into their system by deeply scrutinizing the available research literature in the area and gaining knowledge through the experiences of other libraries. Due to the high cost and complex nature of some assistive aids or devices, library staff should be trained regarding particular technology before providing services to the users. The Librarians have power to minimize the gaps between persons with disabilities and the technologies as now special hardware and software are available to accommodate almost all types of disabilities to help the disabled to realize their potential and to make use of all the facilities of the library.

Innosencia (2017) assessed the accessibility and usability of Information and Communication Technology facilities to facilitate learning among visually-impaired

students at the University of Dar es Salaam (UDSM). The study employed a mixed methods design in gathering, processing and analysing quantitative and qualitative data. A total of 36 respondents took part in the survey. The study found that ICTs support innovative learning, encourage independent learning, and promote participatory and collaborative learning.

Nishat (2017), Studied the information seeking behaviour of visually impaired students in Maulana Azad Library, AMU. A well-structured schedule (Performa containing assets of questions) was designed and administered among the visually impaired students. The schedules were also supplemented by informal interviews. The study shows that most of the users (77.5%) seeking information for their career development. The highest percentage of the users uses audio books as information source and found them fairly accessible but face difficulties also because of lack of computers with screen reader software. More than half of the users (52.5%) are satisfied with the overall functioning of the library.

Tuimur (2017) assessed the availability and use of adaptive technology devices for Visually Impaired (VI) student teachers in the instructional process in primary Teacher Training Colleges (TTCs) in Kenya. The study was based on the Diffusion of Innovation Theory. The study adopted a Mixed Methods research approach and a descriptive survey research design. The study targeted administrators, tutors and Visually Impaired student teachers in three primary TTCs that admit student teachers with visual impairments in Kenya. Census sampling technique was used to obtain a sample. The study used questionnaires and observation checklist. Descriptive statistics was used to analyse the quantitative data. Qualitative data was analysed through a discussion of emerging themes. The findings of the study revealed that, adaptive technology devices for VI student teachers were insufficient.

Kiambati (2018), explored web accessibility and use of assistive technology in accessing e-resources by students with visual impairments (VI). The study was carried out at Kenyatta University-Post Modern Library, and the population comprised of 80 learners and 5 staff members. The study adopted the descriptive survey design. Questionnaires with both open and closed ended questions. Structured interviews were conducted for the staff. The study found that students with visual impairments lacked independence in using e-resources due to web inaccessibility, inability to use AT successfully on the e-platform and low literacy levels in e-resources by students.

Innosencia (2017), studied the accessibility and usability of Information and Communication Technology facilities to facilitate learning among visually-impaired students at the University of Dar es Salaam (UDSM). The study employed a mixed methods design in gathering, processing and analysing quantitative and qualitative data. A survey was conducted at the UDSM main campus and the Dar es Salaam University College of Education (DUCE). A total of 36 respondents took part in the survey. The study found that ICTs support innovative learning, encourage independent learning, and promote participatory and collaborative learning. On the other hand, the units surveyed at the UDSM faced challenges such as insufficient special ICTs to cater for the needs of visually-impaired students, inadequate training on the use of special ICTs, and a shortage of ICT experts.

2.6 Challenges in Accessing Digital Resources

The biggest challenge that visually impaired students face at universities level is the overwhelming mass of printed material which includes books, time schedule, posters newspapers among others. Riley (2002) coined out that students with disabilities experience unique challenges when accessing library resources. Students who rely on screen readers experience barriers accessing information due to their rich graphical

interfaces and complex web designs of proprietary online databases (Horwath, 2002). Bowman (2002), and Byerley and Chambers (2002) confirmed that availability of specific electronic databases with screen reading software were found not user-friendly.

A survey by Horwath (2002) found out that users who were blind or visually impaired on the usability of four databases had greatest impact on the accessibility of the databases. Byerley and Chambers (2002) examined the accessibility of two databases (Online Computer Library Centre, First search and Expanded Academic) by blind students using screen readers. Web content accessibility guidelines were used as a measurement of accessibility. The study established that design elements in both databases compromised the accessibility of the databases (Dermody, 2011).

Additionally, a study by Byerley, Chambers and Thohira, (2007) examined the accessibility of online databases from the database vendors' perspectives. The study further established that vendors rated their products as mostly accessible. The study revealed that although most vendors test their products for accessibility, only a few conducted usability tests with persons with disabilities using assistive technology.

Technology is both an enabler and a barrier for students with print disabilities. Though screen readers enable students to navigate their on-line environment, they are limited on how they can interpret a busy website. Although database and website design is evolving to the benefit of users who have vision, the contradiction is that their enriched features which create greater accessibility to information also creates barriers for students who rely on screen readers (Dermody, 2011).

According to Dermody, (2011), database vendors are aware of the barriers their databases pose to students who rely on screen readers. The study by Byerley et al., (2007), indicated that only five of the 12 vendors (EBSCO, Elsevier, JSTOR,

LexisNexis, ProQuest) surveyed conducted usability testing with people who have visual disabilities. However, Byerley et al. (2007) indicated in their study that vendors are not addressing accessibility in their marketing efforts. Assistive technologies used by individuals who are blind are costly and accessible materials, such as popular books and textbooks, are slow to be developed (Stephanie, Laurie & Maatta, 2014). They asserted that without accessibility features, including voice-over or text enlargement, these readers are rendered inaccessible for individuals who have low or no vision. In a study carried out by (Dermody, 2011) the students were forced to abandon articles because of technological barriers and this limited the number of resources they could use to write their assignments. Only the intervention of a librarian or peer would have allowed them to continue in locating the full text and reading the article. Their self-reliance as independent learners is challenged every time they encounter an unreadable PDF or take up to eight hours to find four articles.

Kisanga (2020), Accessed the challenges students with visual impairment experience in accessing assistive technology and their coping mechanisms in Tanzania's higher education institutions. The study used semi-structured interview and an open-ended questionnaire to collect data from17 students with visual impairment and four transcribers. The resultant qualitative data was subjected to descriptive and thematic analysis. The study found out that lack of knowledge on how to apply assistive technologies, limited ICT infrastructures, and shortage of assistive technology tools as major challenges for students with visual impairment when accessing assistive technology in higher education institutions.

Mohammed (2016) found out that one of the difficulties that the Visually Impaired Users experience in using e-Learning websites is the lack of effective Knowledge Transfer due to limitations in these websites such as usability and accessibility

problems among others. The paper focused on the transfer of Islamic knowledge for VIUs through e-Learning websites in Malaysia. Qualitative method through the use of interviews was used for the study. Respondents consisted of three groups which consist of 14 visually impaired users, 14 Knowledge Providers (KPs) and 13 Service Providers (SPs) in 15 Malaysian institutions and organizations. Thematic analysis following inductive approach was used to analyse the data obtained from the respondents

Olaopa (2017), researched on provision and utilization information resources of various types are important in every educational setting to sustain learning activities. The study investigated factors affecting information resources utilization such as information literacy skills and availability of alternative format by visually impaired students in South-West. Descriptive survey design was adopted and the study population consisted of 164 visually impaired students in eight secondary schools selected for the study. Total enumeration sampling technique was adopted for this study. Data was analysed using descriptive statistics for the four research questions and five research hypotheses were tested using Pearson product moment correlation and multiple regressions, respectively. The result showed relationship that information literacy skills of persons with visual impairment have significant relationship with information resources utilization in the selected libraries.

Ahmed and Naveed (2021), aimed to explore the actual situation of information accessibility for university students with visual impairment at higher academic institutions of Lahore, Pakistan. The research adopted a qualitative research design using interpretative phenomenological analysis (IPA) to investigate the proposed phenomenon. The participants of the study were recruited with purposive sampling from higher academic institutions for data collection. Face to face interview of 15

visually impaired students was conducted using an interview guide. The results indicated that these students utilized interpersonal relationships as the primary source of their academic information. The study also found that other available facilities for information access included the internet, disability resources centre, and the university library. Khan (2016), researched on the information literacy for visually impaired teachers in Pakistan. The study examined how Visually Impaired teachers identify and apply information in teaching and everyday life. The study used the interviews to obtain information. The study used data from 55 visually impaired teachers in 10 schools for the blind located in the province of Khyber PukhtunKhwa, Pakistan. The study also explores their ability to find, evaluate, and apply pedagogical information. Collected data revealed information on different aspects of information literacy skills. Although basic skills of the studied population were assessed; the study found that visually impaired teachers are highly skilled in terms of organizing the information and they prefer to take personal responsibility while searching for required information.

Chigbu (2017), examined the information literacy skills of blind and visually impaired students for effective access to information in the University of Nigeria, Nsukka. The study used questionnaire and interview for data collection were. The population of the study comprised 95 visually impaired students of the UNN. Descriptive statistics of frequency mean was used to analyse the data from questionnaire while data obtained from interview was analysed qualitatively. The result revealed that the visually impaired students possess adequate information literacy skills that will enable them to excel in their academic endeavours, though with some challenges.

In learning the use of Assistive Technology for Teaching-Learning and Administrative Processes for the Visually Impaired People. Silman (2017), examined

how technology used in the Cyprus Turkish Blind Association assisted the teaching-learning and administrative processes for the visually impaired. Qualitative research techniques were used for data collection and analysis. The study found that with the assistance of technology the participants of the study were quite motivated and could easily communicate with each other and also with people outside their organization.

Kamaghe (2020), determine to study the awareness and usage levels of existing mobile assistive technologies for visual impairment, and the remaining challenges that visually impaired student's face, when using such tools on smartphones to access m-learning content from HLIs in Tanzania. The research conducted an observational and contextual inquiry study at three major HLIs. The study found that 67% of respondents did not have knowledge of m-learning assistive technologies, and their technology barriers for visually impaired students. The current study specifically sought to determine the information seeking behaviour of the VI students using the digital resources.

Lutfun (2015), in the paper discussed the overall situation of VIS in Bangladesh and identifies major challenges that they are facing in getting education. The study indicated that Braille system is followed to educate blind students in Bangladesh. However, they also found that lack of Braille based educational resources and technological solutions have made the learning process lengthy and complicated for VIS. The study also indicated that Bangladesh, being a developing country cannot afford for the costly Braille related technological tools for VIS. Therefore, a mobile phone-based Braille application, "mBRAILLE", for Android platform was designed to provide an easy Braille learning technology for VIS in Bangladesh. The proposed design was evaluated by experts in assistive technology for students with disabilities, and advanced learners of Braille. The application aimed to provide a Bangla and

English Braille learning platform for VIS. The paper depicted iterative design of the application along with a preliminary evaluation with 5 blind subjects, and 1 sighted and 2 blind experts. The results show that the design scored an overall satisfaction level of 4.53 out of 5 by all respondents, indicating that the design was ready for the next step of development. The current study however used 25 Visually Impaired Students to gather information and 6 Key Informants.

In their article, Mahfuz and Husain (2021), determined the problems and the status of the visually impaired students in Bangladesh under the COVID-19 global pandemic. The study employed mixed methods for data collection, encompassing a quantitative survey questionnaire followed by qualitative phone interviews. The study reached out to approximately 15 male and female students enrolled in public and private higher educational institutions in the country. The findings of the study were found to be instrumental to initiate a collaborative discussion among academics and practitioners in the government, non-government and private sectors in the country and around the Global South.

Rhind (2011), Conducted a study on the effects of institutions resources on Higher Education for students who are visually impaired. The study employed Semi-structured interviews with nine visually impaired students who were studying at a Higher Education Institution in the United Kingdom. The study found out that campus navigability, central services support, school-level support affected the information seeking behaviour on digital resources by visually impaired students at the institutions of the United Kingdom.

Majinge and Mutula (2018) discussed the implication of copyright on access to electronic and print information resources by people with visual impairments in

university libraries. The paper examined challenges facing people with visual impairments in accessing electronic and print information resources. The study was based on review of empirical and theoretical literature and is underpinned by Oliver's (1990) social model of disability. The findings reveal that many university libraries the world over lack the capacity to offer an effective information service to people with visual impairments. Furthermore, the stringent copyright laws and licensing regimes for purchasing or transcribing content from one format to another make provision of information services to people with visual impairments difficult.

Xie (2019) conducted a study to test whether implementing help features corresponding to BVI users' needs can reduce five critical help-seeking situations they typically encounter, with the goal to further enhance usability of DLs. Multiple data collection methods including pre-questionnaires, think-aloud protocols, transaction logs, and pre and post search interviews, were employed in an experimental design. Forty subjects were divided into two groups with similar demographic data based on data generated from pre-questionnaires.

Ndalahwa (2018) investigated the challenges facing students with visual impairment in accessing e-learning at Tabora Girls Secondary School in Tabora Municipality. Specifically, the study sought to identify problems facing visually impaired students in accessing e-learning. A descriptive research design was adopted where a total of 50 respondents including visual impairment students, teachers and resource personnel. Data were collected using structured questionnaires and interview. Research findings revealed that there are various academic problems facing visually impaired students in accessing e-learning at Tabora Girls Secondary School. Among the academic problems pointed out to affect students with VI were; insufficient equipment such as

digital recorder, memory card, Braille, e-book reader device and ICT facilities including computers, embosser, modems, magnifiers, screen readers.

Majoni and Mashatise (2017), determined the challenges faced by students with blindness studying through open and distance learning. The study sought to find out the problems faced by blind students studying through open and Distance Learning. A case study of a blind student enrolled in 2014 at Mashonaland Central Regional Campus of the Zimbabwe Open University was the focus of this research. Data were generated through interviews and observation. Data were qualitatively analysed. The study found out that the students with blindness should have the technical equipment that can be presented or adapted to be relevant to them. The current Study focused on both challenges and strategies to overcome them.

Ampratwum and Offei (2016), aimed at exploring barriers to the use of computer assistive technology among students with visual impairment at Akropong School for the Blind. A case study design was adopted and the purposive sampling technique used to select 35 participants for the study. Qualitative data was gathered using an in-depth interview guide to investigate barriers to the use of keyboarding skills and Job Access with Speech (JAWS). Data were transcribed and analysed thematically. This was done using both the narrative methods and opened quotes from interviews. The findings indicated that challenges limiting effective use of computer assistive technology in the school were more personal than external influences. This was because most of the challenges were due to the individual response to the training and familiarity in developing their competencies in using computer assistive technology.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter gave the systematic and theoretical analysis of the procedures that the researcher used in conducting this research. It includes a description of the research design, the target population, sample and sampling procedures, research instruments, data collection and analysis procedures, data presentation methods, data management and ethical standards. This was given with each section accompanied with factors validating their utility choice in this study.

3.2 Research design

This is the overall strategy that the researcher used to integrate the different components of the study in a coherent and logical manner. The major purpose of this study was establishing information seeking behaviour on digital information resources by visually impaired students at UON library. To do this, the study followed appropriate design to improve relevance and accuracy of research findings by using pertinent available size of respondents.

The research design adopted for this study was Descriptive survey to describe the information seeking behaviour of visually impaired students on digital resources at UON library Kenya. Descriptive survey was used to learn more about an individual or a selected group of people or a single unique characterize data and features about the population or phenomena under investigation. It's a way of gathering data by interviewing or delivering a questionnaire to a group of people Kabir, (2016). Descriptive survey allowed for an intensive investigation since sub- methods such as observation and questionnaire was employed within the study.

3.3 Research Approach

This study used mixed method of qualitative and quantitative approach. Mixed method study is a methodology for conducting research that involves collecting, analysing, and integrating or mixing quantitative and qualitative research and data in a single study (Wisdom, and Creswell, 2013). It involved integrating quantitative and qualitative approaches to generating new knowledge and can involve either concurrent or sequential use of these two classes of methods (Stange, 2006). Its basic principle is that the combination provides a better understanding of research problems than either approach by itself alone (Creswell, 2015). This enabled the researcher to develop a level of detail from high involvement in the actual experience. However much this design is less structured in description, it formulates and builds new theories. It involves purposeful use of describing, explaining and interpreting the collected data.

3.4 Location of the study

This study was conducted in Nairobi, capital city of Kenya, specifically it confined itself in University of Nairobi Library (1.2795°S, 36.8159°E).

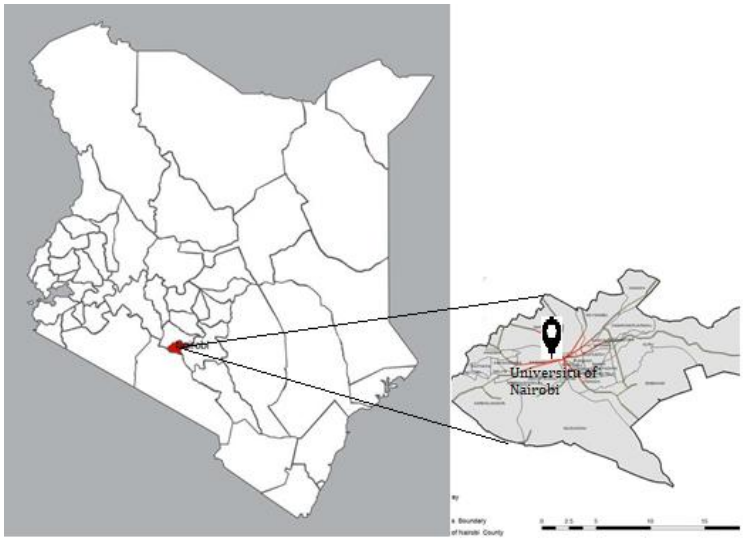

Figure 3. 1: Map of Kenya indicating area of study

Source: Research Gate, 2019

This study location was opted by the researcher due to its inclusivity and due to the fact that the library it has, contain section that is specific to students with visual challenge at the same time have adequate number of visually impaired students.

3.5 Target population

The research population is considered a critical part of any survey. A target population consists of all elements or units of analysis about whom survey information is collected (Banerjee & Chaudhury, 2010). In social scientific research there is a wide range of variation in what or who is studied, what is technically called units of analysis. Units of analysis are defined by Welman, Kruger and Mitchel (2005) as those we examine in order to create summary descriptions of all such units and explain differences among them. Two different populations was targeted for this study, the visually impaired students and the digital librarians.

3.5.1 Visually impaired students

The first elements of analysis were visually impaired students who were administered with questionnaire and fits the following criteria, which was also used by Shunmugan (2002). They were either totally blind or visually impaired; they were registered students at the UON and they were known by the Disability Unit of UON and registered as blind or visually impaired. They utilized or required one or more of the specialized support services made available to facilitate their learning and integration at campus.

3.5.2 Digital librarians

The second element of analysis was six (6) digital librarians at UON Library main campus who are the main information providers to the VI students, they were selected because they assist the VI in meeting their information seeking needs at university of

Nairobi library. Questionnaires were administered to them that was structured differently from the VI questionnaire. The digital librarians were used as key informants in accordance with the definition of Bobbie and Mouton (2001) that an informant is someone well versed in the social phenomenon that you wish to study and willing to tell you what he or she knows.

3.6 Sample size and Sampling technique

The target population being VI students from UON that are made up of 32 VI students and 6 key informants, the researcher opted to involve all of the VI students and the key informants who would give consent to participate in the research. The respondents in this study were identified using a census-sampling approach. The census sampling approach is used to target a specific group of individuals with a population size of fewer than 100, According to Lærd (2012), total population sampling is a type of purposive sampling technique that involves examining the entire population that have a particular set of characteristics (for example specific attributes/traits, experience, knowledge, skills, exposure to an event, among others). In the case of total population sampling, the units of interest tend to have some characteristics that are not very common. The uncommon characteristics are those characteristics that were interested in. In this case, the uncommon characteristics are the fact that the people such as units of interest are all visually impaired. On the other hand, six information providers were sampled purposively. Because they can provide the required information in the area concerned. The selected groups of information providers were few in number, easily accessible and with some experiential knowledge concerning information seeking behaviour of VI students. As they were interacting frequently with VI students, the intimacy helped information providers to develop some knowledge concerning information preference, role of people in

academic life of visually impaired students and some more. UON have been hosting several students coming from different corner of the country, to get over all VI population of the study, it is important to answer the question where and how many. Since VI students are few in number in these university, entire population of VI in the university was used for the study.

3.7 Data collection instruments

There are various types of devices that can be used to collect primary data, according to Kumekpor (2002). In social examinations, information must be gathered from people or institutions that are specifically interested in the topic to be studied. As a result, when selecting or deciding on the instrument to be used to collect data, the following factors must be considered: the resources available, the researcher's skills, the characteristics of the population, and most importantly, the purpose of the study. Furthermore, the background of the investigation is an important aspect of the study. Some of the target population may not be comfortable with a specific approach utilized; consequently, the researcher should thoroughly analyse the instrument to be used, as the main goal is to obtain adequate data freely from the community. As a result, when determining which technique to employ, the researcher should consider the following: the type of individuals to choose, their description, the mood, and the social context, not to mention their mental set. To collect primary data, the study used an open and closed questionnaire as well as an observation technique.

3.7.1 Semi-Structured Questionnaires

A semi-structured questionnaire is a mix of closed- ended and open-ended questions. The first instrument of data collection that the study used was through the use of questionnaires. Questionnaires are a set of written questions that the respondent answers in writing. The questions in the questionnaire were designed and structured

according to the research objectives. The questionnaires were used for the reasons: that they are able to give the respondent's adequate time to respond to the items; they offer a sense of security or confidentiality to the respondent; and they are objective since no bias resulting from the personal characteristics of the respondent can influence the data collected. Questionnaires gave the key informants and visually impaired student's freedom to express their views in their own way.

3.7.2 Direct Observation

Data was gathered primarily through close visual inspection of the natural setting. The researcher strived to be unobtrusive as possible so as not to bias the observations and also detached from actively participating in the setting. The researcher observed keenly the behaviour of the VI students such how they interact with the adaptive technology, how they seek the information and barriers to information access. This was achieved through the use of observation protocol or schedule data collection instrument. One advantage of direct observation was, it offered contextual data on settings, interactions, or individuals (Kawulich, 2012). The observation results were to complement the questionnaire from both the digital librarians and the VI students.

3.8 Data collection procedure

The questionnaire for visually impaired students were transcribed to Braille format to make it easier for respondents to answer. The questionnaire were administered to visually impaired students and key informants by the researcher. The answered braille copy of the questionnaire were then sent to the Resource Centre to transcribe their responses from Braille format to print format. All respondents were asked the same questions with the same wording and in the same sequence (Corbetta, 2003). The researcher had face to face contact with each and every respondent to collect the data in the respondents‟ spare time. In the case of information providers, the

questionnaires prepared were different from the guideline that was prepared for VI students. This guideline contained questions that concerns their knowledge gained about VI academic experience. For those VI students who had the challenge to fill the braille questionnaire the researcher assisted them to fill on behalf of them.

3.9 Piloting of data collection instruments.

Pre-testing of the questionnaires were done to eliminate any ambiguities and mistakes by giving two experts from the Department of Computing and Information Sciences at Maasai Mara University to judge whether all items in the instrument were really related to the objectives. On the other hand, to ensure the stability of the questionnaires, a pilot study was carried out before the actual study whereby the questionnaires were administered to two (2) Visually impaired students and (2) digital librarians who were purposively selected from Kenyatta University, this was a location that was used during the main study. The scores was further correlated to understand the reliability of the instrument in measuring the variables of the research. The main purpose of the test and retest was mainly to test how reliable and valid the instrument were, reduce the uncertainty and polish the instrument effectively thus collecting the data accurately or truthfully (Ikart, 2019). In doing pilot study it allowed the researcher to; identify any uncertainty and ambiguous questions, making words clear, enhance rephrasing of sentences in providing enough room for answers in doing so the layout of the instrument will be revised to attain the objective of the study. It was therefore necessary to adjust the changes for that reason before the commencement of the actual data collection process the tools that was questionnaire was there after adjusted accordingly to suit the objectives. Pre testing feedback was mostly positive. The people involved in the pretesting were satisfied with the length of the questionnaires based on its purpose.

3.9.1 Validity of the questionnaire

It is the degree to which the results obtained from a research instrument represent the phenomenon under study. According to Orodho (2012) a research instrument is said to be valid when it is able to measure that which it is supposed to measure. It is the degree to which the results obtained from a research instrument represent the phenomenon under study. For this study both face and content validity were tested. Face validity entailed ensuring that the questionnaire is simple and precise but comprehensive enough to collect the required data. Face validity is also achieved through the structure and flow of the question items. On the other hand, Content validity test was done by using two experts from the department. The two experts were asked to make their responses which were used in the computation of the validity coefficient index (VCI) as defined by Amin (2005).

$$\text{VCI} = \frac{\text{Average of number of common responses from the two experts}}{\text{Total number of question items on the question}}$$

According to Amin (2005), a VCI of 0.6 and above is acceptable for an instrument to be considered as valid.

VCI for the VI students = 12 /17 = 0.71

VCI for the Key informants = 16/21 = 0.76

3.9.2 Reliability of the questionnaire

Reliability is the degree of measure that shows that a research instrument was able to provide similar responses when subjected to different samples drawn from the same population (Kimberlin & Winterstein, 2018). The reliability of the questionnaires was tested using the parallel form reliability method. The questionnaires for the VI students were written in Braille language while those of the key informant were written in English language to facilitate effective communication among digital

librarian and students with Visual Impairment. Besides, the Cronbach alpha reliability test was applied, the questionnaires were administered once and the reliability was then tested with the help of Statistical Package for Social Sciences version 25. The questionnaire were considered reliable if the alpha coefficient index was 0.7 and above as per Kothari (2014). From the computation done using SPSS, the Cronbach alpha reliability test showed that the two questionnaires were reliable as they returned a Cronbach coefficient value of 0.765 for the visually impaired students and 0.810 for the key informants' questionnaire. This was presented in table 3.1.

Table 3. 1 Reliability Statistics

Respondents	Cronbach's Alpha	N of Items
Visually Impaired Students	0.765	17
Key Informants	0.810	21

3.10 Data analysis procedure

According to Twumasi (2001) Data of a study are raw information obtained in the course of an investigation. Analysis means a critical investigation of material in order to recognize its portions and its connections to ascertain its trends. The procedure of data analysis is a constant one which involve various steps, entry, editing, tabulation, coding and computer processing.

After completion of data collection, the quantitative and qualitative data collected from VI students and information providers was analysed using mixed method. Mixed methods research combines elements of qualitative and quantitative research approaches for the purposes of breadth and depth of understanding and substantiation (Johnson et al., 2007). Mixed methods research involves collecting both quantitative

and qualitative data and merging, linking, or combining of the two sources of data, and then conducting research as a single study or a longitudinal project with multiple phases (Creswell & Garrett, 2018). There are six mixed methods design strategies. Among these, sequential explanatory mixed method design is used for this study. Sequential explanatory mixed method design characterized by collection and analysis of quantitative data followed by a collection and analysis of qualitative data to use qualitative results to assist in explaining and interpreting the findings of a quantitative study (Creswell, 2013). In this study, the quantitative data of VI students and information providers was analysed using SPSS software version 25 and described in frequency distributions and percentage. To support and enhance the result of quantitative data analysis, the qualitative data was analysed and described in words. Similarly, the interpretation of both quantitative and qualitative data analysis brought to conclusion. Finally, the convergent result of analysis was used to illustrate information seeking behaviour of VI students on digital resources.

3.11 Ethical Consideration

A major concern of people who were involved in surveys was giving their information to a third party as such information can be gathered and misused. The questionnaires were therefore, carried out in anonymity as participant's identity was not revealed and adhered to the data protection act.

The researcher also was objective and avoided biasness in all aspects of the research. This included the research design, data analysis, and interpretation. The researcher treated all respondents without any bias whatsoever.

Confidentiality was maintained in all instances. The researcher assured the respondents that they would remain anonymous and that confidential information obtained in the research would only be used with permission from them. The

researcher also followed guidelines on protection of sensitive information provided in the course of conducting the research. This would involve concealing details of the respondents that could make them easily identifiable.

The researcher was careful so as to avoid any mistakes while conducting, analysing and reporting the research findings. The work was reviewed carefully and critically so as to ensure that the results were credible. Full records of the research were also kept in the event that reference may need to make on them.

CHAPTER FOUR

RESULTS, INTERPRETATION AND DISCUSSIONS

4.1 Introduction

This chapter entails the results of the study which were presented and discussed along research objectives and research questions that guided the study. The study sought to establish information seeking behaviour on digital resources by visually impaired students at the university of Nairobi library, Kenya. The study sort to answer the following questions; (1). How does information seeking behaviour by students with visual impairment affect their access to digital information resources? (2) How does adaptive and assistive technology impact students with visual impairment in accessing digital resources? (3) What could be the challenges that students with visual impairment face in accessing digital information resources? (4) What could be done to mitigate the challenges that VI students face in accessing digital resources?

The results from the questionnaires and only ONE question on the space and the available adaptive/ assistive technology in place that used an observation protocol to collect data are presented in this chapter.

4.2. Questionnaire Return Rate

A sum of 38 questionnaires were administered to the visually impaired students and key informants at the University of Nairobi. Responses were received from 25 of VI participants out of the 38 and 5 from the key informants, this constituted a response rate of 78.95% with the rest of the respondents either not giving their consent or not finding time to respond to the questionnaire, this was however considered to be adequate for the research study. According to Mugenda and Mugenda (2003) a response rate of 70% and above is considered adequate for data analysis.

4.3. General Information

Part of the questions in the questionnaire issued to visually impaired students at the University of Nairobi covered their general information. The general information for this research study included; gender of the responses, age, mode of study, and level of study.

The general information provided by the respondents of this research helped the researcher to acquire relevant information on the information seeking behaviour on digital resources by visually impaired students at the university of Nairobi library services, Kenya.

4.3.1 Gender of the respondents

The data obtained from the study on the gender of the respondents is illustrated in **figure 4.1.**

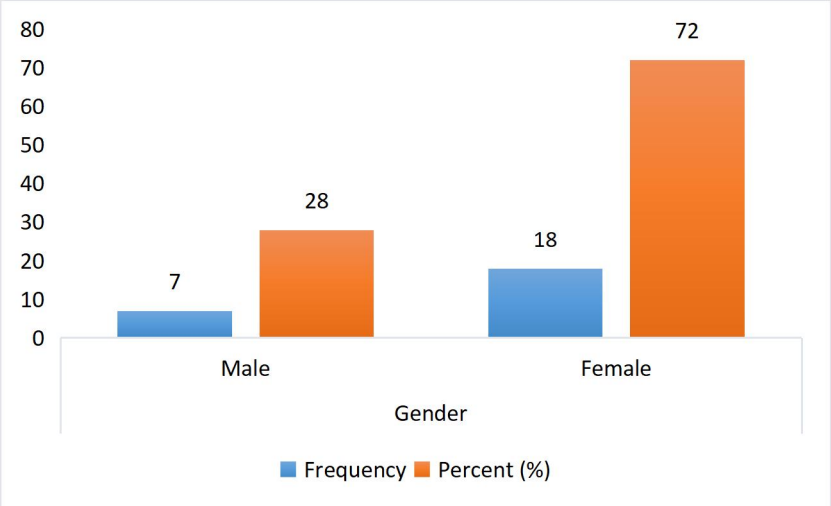

Figure 4. 1: Gender of the respondents

Source: Researcher, 2021

The findings revealed that majority of the VI students were female (18) 72% of the total respondents while the male (7) accounted 28% of the respondents. The findings indicated that most of the VI students were female. This agrees with Ndegwa et al.

(2006) in his study, it was established that females had higher prevalence of visual impairment compared to males.

The study further administered questionnaires to the key informants, where two were male and three were female. This was done to get a better insight on the information seeking behaviour on digital resources by VI students at the University of Nairobi library.

4.3.2 Age of the respondents

The age of the respondents is presented in **figure 4.2.**

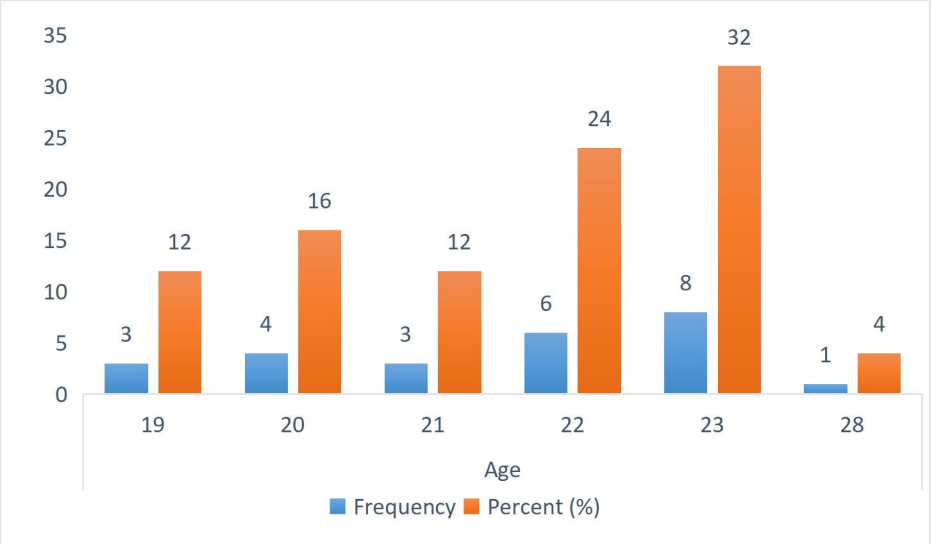

Figure 4. 2: Age of the students

Source: Researcher, 2021

The study noted that the respondents were between the ages brackets of 19-28 years. From figure 4.2**,** majority (8) 32% of the respondents were 23 years old, followed by those at the age of 22 years with response rate of (6) 24%. Respondents with the age of 20years were (4) which represented 16% of the total population. Those at the age of 19 years and 21 years both had a similar response of (3) students each which represented 12% of the total population each. Lastly, one of the respondents was at the age of 28 years, this represented 4% of the total population. The information

showed even though the students were VI they were able to be at the university at younger age.

The age of the key informants ranged between 22-45years. This implied that some of the key informants were almost of the same age with the VI students and would have interacted freely without any barriers.

4.3.3 Mode of study

The mode of study of the Visually Impaired students is illustrated in figure 4.3.

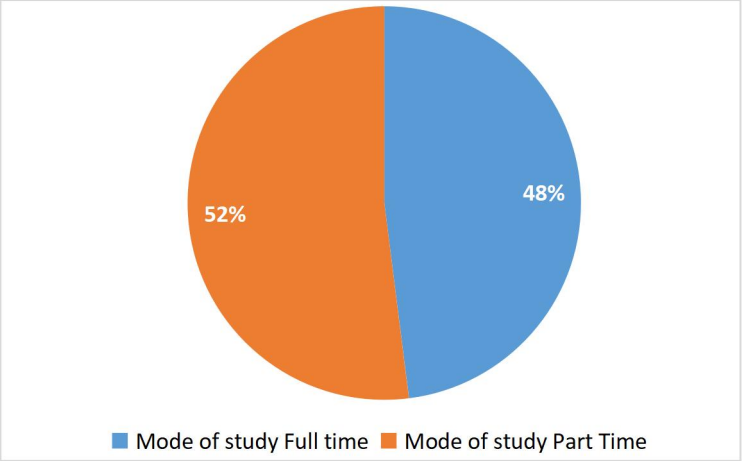

Figure 4. 3: Mode of study

Source: Researcher, 2021

Mode of study majorly influences the performance of students at different stages of their education. It was therefore important to know the modes of study of the VI students from the University of Nairobi. From the findings of this study (figure 4.3), it was established that majority 52% of the VI students were part time while 48% were full time. However, the smaller difference, the study was concurred with those of Marinelli (2013), who revealed that there was low enrolment of VI students in regular schools or on full time basis. Marinelli (2013),cited inadequate motivation, negative attitude, inflexible curriculum, lack of resources and poor teaching methods as to the reason VI students prefer part time mode of study.

4.3.4 Level of Study

The level of study of the VI student was of key importance on establishing information seeking behaviour on digital resources by visually impaired students since different stages of education will require one to have advanced digital resources. The findings of the study on the level of study of the VI students is illustrated in **figure 4.4**.

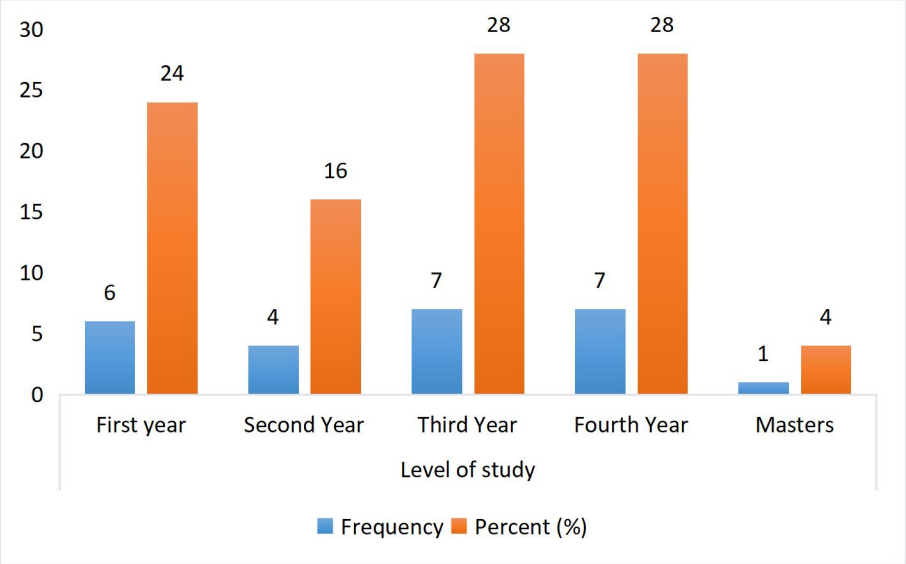

Figure 4. 4: Level of study

Source: Researcher, 2021

From figure 4.4, the study revealed that majority (7) 28% of the VI both were in their third and fourth year of study each. It was followed by (6) 24% of the students who were in their first year of study. Similarly, (6) 24% of the respondents were in their second year of their study. Lastly, one of the respondents which comprised 4% of the total population was at master's level.

4.4 Establishing information seeking behaviour by students with VI in accessing digital resources

The first objective of this study was to establish information seeking behaviour by students with visual impairment in accessing digital resources. The questions that guided the objective were; what information do you need to support your learning? What equipment do you mostly need to enable you to learn effectively? How do you search for information in your library? All the questions were asked to all the respondents that took part in the study.

4.4.1 Information needed by VI students to support their Learning

The study sought to find out the information needed by the VI students in order to support their learning. The analysed data is illustrated in **table 4.1.**

Table 4. 1: Information needed by VI students to support their learning

Information needed to support Learning for VI Students		
	Frequency	**Percent (%)**
Use of aiding tools	17	31.48
Use of Voice induced reading materials	7	12.96
Research work/Projects	3	5.56
Use of computers	12	22.22
Provision of curriculum in alternative format	2	3.70
Barrier free access to disabled	3	5.56
Independent reading of text books	2	3.70
Finding People in a crowd	1	1.85
Locating rooms	3	5.56
Level of disability	4	7.41

Source: Researcher, 2021

The findings of the study showed that most of the VI students 17 (31.48%) believed that getting information on how to use aiding materials such as braille books, white cane and handheld magnifiers will support the learning which in turn better their learning process. It was followed by 12(22.22%) of the VI students who revealed that getting information on how to use computers to search information, reading and doing their assignments and research will support their learning at a higher extend. Some of the VIS believed that getting information on the use of voice induced reading materials was likely to bettering their learning. Similarly, 4(7.41%) of the VI students believed that knowing their level of disability will enable them to know the exact materials to use during their learning without struggling since most of them said that they were slow in grasping the information which could have resulted from the use of wrong devices or reading materials. The finding also indicated that 3(5.56%) of the VI students each believed that locating of rooms, barrier free access to the disabled and information on scholarly research and project work is the main information that they need to support their learning. Smaller percentage, 2(5.56%) each of the VI students said that provision of the curriculum in an alternative format and independent reading of text books will support their learning. Finally, 1(1.85%) of the respondent believed that their ability to locate or find people in crowds was likely to support their learning.

One of the respondents said that:

"...the most important information that I think is very necessary is how to use a wide variety of digital assistive devices present in our library and how to get access to the programs that are in the internet and websites" [respondent 1 from University of Nairobi, July 2021].

Another respondent added that:

"...I need braille prints, regular prints, tactile symbols and some recorded materials for effective communication" [Respondent 2 from University of Nairobi, July 2021].

Still on the information needed by VI students to support their learning from University of Nairobi library, another respondent added that:

"...as a visually impaired learner I would like to be more conversant with digital resources such as computers, the internet, e-booKs, other e-learning resources and other audio devices...this can be achieved by being more oriented about how to access these resources, how to use them effectively for learning purposes, as well as how to retrieve information and keep the information well for the purpose of future reference". [Respondent 7 from University of Nairobi, July 2021].

Some students believed that obtain what is needed to support their learning will give them an equal opportunity just like their sighted friends. The respondent said that:

"...I need to get information on how to utilize or use a broad range assistive technologies such as screen readers screen magnifiers, and sound recognition software's that are available in our library to provide us access to information in electronic databases and on the internet, will give me an equal opportunity as my sighted friends." [Respondent 9 from University of Nairobi, July 2021].

Copyrights prevents the access of information and thus hindering learning for most VI students, the know-how on whether certain information is restricted or not will make their learning efficient. One respondent said that:

"*…I need to know how to use digital texts, how to download onto a PC to enable me as visually impaired user to choose my own preferred method of access*

whether by screen magnification, speech or Braille output. Although there are many texts that are available in digital format now, there are many more that are not in our library, particularly new publications that are copy-right protected so having skills on the usage of these resources will make my work easy since digital collections that are freely accessible contain only documents that are copy-right free." [Respondent 16 from University of Nairobi, July 2021].

VI students believed that hearing isn't enough but knowing how something looks like will give them a better insight of understanding. The respondent said that:

"...first you should know that we do it by touch and also hearing, so when it comes to information we need to do this as if there is a way in which we can do learning through a talking computer and then it will be very good for us to learn very well…Again we need some people to guide us on how this learning goes who can either be a resource person, ..At some point we have something that we hear through listening but don't know how this looks like or is it an object and which type of an object is it and that is why we need a guide, at some point the braille machine isn't enough for us to learn we need to hear more information". [Respondent 17 from University of Nairobi, July 2021].

The findings of the study from the VI students were in agreement with those of the key informants who noted that they need to know the vision level of the students, students' knowledge on the use of assistive technologies like braille and the attitude towards visual disability.

One of the key informants noted that:

"...I need to understand his/her braille background, the attitude towards the visual disability and to understand the extent of blindness". [Key informants C from University of Nairobi, July 2021].

4.4.2 Equipment mostly needed by VI students to enable them get information for effective learning

Visually Impaired students rely on various equipment on their learning process. Among the learning equipment, the respondents provided the equipment listed in **table 4.2**.

Table 4. 2: Equipment mostly needed by VI students for effective learning

Equipment mostly needed by VI students for effective learning		
	Frequency	**Percent (%)**
Optical Character Recognition (OCR)	6	11.32
Screen readers/speech synthesizer	10	18.87
Braille	10	18.87
Digital Computers	10	18.87
Audiobook	2	3.77
Electronic texts	2	3.77
Magnifiers	5	9.43
Human Readers	3	5.66
Audio Cassettes	3	5.66
Headphones	2	3.77

Source: Researcher, 2021

The findings established that most of the VI students 10(18.87%) each trusted that provision of Screen readers/speech synthesizer, Braille, and Digital computers are most commonly needed equipment by VI students with VI. It was followed by 6(11.32%) of the VI students who believed that Optical Character Recognition (OCR) is mostly needed equipment by VI students for effective learning. Magnifiers

followed as the mostly needed equipment by VI students with 5(9.43%). Other equipment that was mostly needed are human readers and audio cassettes with response rate of 3(5.66%) each. Finally, headphones, electronic texts, and audiobooks were as well needed with response rate of 2(3.77%) each.

The showed that most of the VI students mostly need equipment such as; screen readers, Optical Character Recognition (OCR), Screen readers/speech synthesizer, Braille, Digital Computers/Computers, Audiobook, Electronic texts, Magnifiers, Human Readers, Audio cassettes and headphones. One of the respondents narrated that:

"...I think an Optical Character Recognition (OCR) system is more efficient and reliable for me because it is able to scan a printed document into a computer and convert the image into text characters and words, which screen readers and braille embossers cannot recognize. For example, if a pre-scanned electronic image is already available (e.g., if you have a PDF file), OCR systems can convert synthesized speech, screen enlargers, and Braille embossers". [Respondent 1 from University of Nairobi, July 2021].

Similarly, I relation to equipment needed by VI students in University of Nairobi Library, the respondent said the following:

"... I need screen readers, braille displays such as focus, and some software such as braille notes and Google braille back, and special sound recognition software." [Respondent 2 from University of Nairobi, July 2021].

Another respondent stated that equipment that are more advantageous to them in terms of convenience are the most appropriate equipment that they mostly need to enable them get information and learn effectively. The respondent said that:

"...Electronic texts (computer text files). With this, I can load an electronic text in computer and read the text from computer using screen magnifying software, I can also print the text in large print and read it from paper, I can read text using braille bar that is attached to the computer and can have the text read out loud by the computer, using screen reader, it is more convenient and quite advantageous for me". [Respondent 9 from University of Nairobi, July 2021].

One of the respondents further explained that;

"...I think speech synthesizer or a screen reader is best for me because it reads aloud the texts displayed on the screen compared to the braille display which only accesses one line at a time and does not caption the whole page on the screen, it is not very convenient in accessing digital information". [Respondent 16 from University of Nairobi, July 2021].

Further, the findings of the study from the key informants indicated that the equipment mostly needed by the VI students at the University of Nairobi are; the screen readers, computers, mobile phones, braille printers, braille translation software, headphones and JAWS. The findings were in agreement with that from the VI students.

4.4.3 Ways through which VI student search for Information in Libraries

Searching of information is very critical in any learning/research environment, however, it is more crucial for VI students since most of them are slowly in grasping information as well as locating the study spaces. The study therefore sought to establish the ways through which VI students search for information in a library. The analysed data of the study was presented in table 4.3.

Table 4. 3: How VI students search for Information in Libraries

Ways VI students search for Information in Libraries		
	Frequency	**Percent (%)**
Screen Readers	3	7.32
Assistance from sighted person/librarians	10	24.39
Use of Braille printers	3	7.32
Use of search engine/web browsers	7	17.07
Use of audio books	3	7.32
Computer	7	17.07
Orientation and mobility skills	3	7.32
Use of mobile app Tap Tap	1	2.44
Speech synthesis	4	9.76

Source: Researcher, 2021

The results from the study revealed that majority 10(24.39%) of the VI students finds it hard to search for information in the library not unless they get assistance from a sighted person which can be friends or the librarians. It was followed by 7(17.07%) the VI students who had digital skills and were able to search for information from computers and search engines/web browsers. The findings also indicate that 4(9.76%) of the VI students used to search of information in libraries by use of speech synthesizers. An equal number of respondents 3(7.32%) each revealed that they search for information by use of screen readers, braille prints, audio books and by the help of orientation mobility skills (figure 4.5 and figure 4.6). One of the respondents who represented 2.44% of the total population indicated that they search information by use of mobile app called Tap Tap.

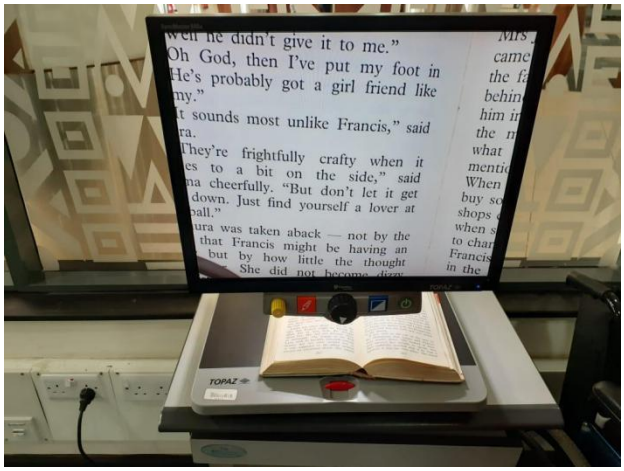

Figure 4. 5: Screen reader

Figure 4. 6: Braille Printer

The findings revealed that most of the VI students from University of Nairobi were getting assistance from their sighted friends when searching information in the library. One respondent explained that:

"...I request a sighted person to visually skim a website to find the section I want to read then I do the same with screen reader as the website's content has been coded with proper header tags". [Respondent 2 from University of Nairobi, July 2021].

Similarly, the VI students search information from the University of Nairobi library by use of computers as well as by browsing from the search engines with the help of internet. The respondent gave the following information:

"... Screen readers are available in our library which helps us to transmit the text that is displayed on the computer screen into a form that we can process. The software helps by providing synthetic voice to read the text aloud and also to communicate it through e-mails...We also have screen magnification software with speech suitable for computer users with low vision which magnifies computer screen from 1 to 60 times its usual size, it is a nice device". [Respondent 1 from University of Nairobi, July 2021].

Furthermore, on the ways through which visually impaired students search information in University of Nairobi Library, the key informants identified the following ways: Help by their classmates/library personnel, online catalogues, screen readers, JAWS and their mobile phones. This information from the key informants was in agreement with those of the VI students.

4.5 How existing assistive technology impact VI students in accessing digital information resources

The second objective of the study aimed at determining how existing assistive technology impact students with visual impairment in accessing digital information resources. The objective was guided by the following research questions; Are there digital resources in your library and how sufficient are they in your library? Are you able to access digital resources without any assistance? If yes which technology, do you often use to access to digital resources and how long do you take? If no, how do you handle your research work? Have you ever attended training or workshop on

access to digital resources? What was some of the training? How do you use your digital resources for visually impaired in your library?

4.5.1 Availability and sufficiency of digital resources for VI in their library

The study sought to establish the availability and sufficiency of the digital resources for VI students in the University of Nairobi library. The findings of the study are illustrated in table 4.4

Table 4. 4: Availability and sufficiency of digital resources for VI students

Availability and sufficiency of digital resources for VI	**Percentage (%)**	
	Yes	**No**
Availability	92	8
Sufficiency	31.58	68.42

Source: Researcher, 2021

The findings showed that majority 92% of the respondents agreed that digital resources for VI students were available in their library. A smaller number 8% said that the digital resources were not available in their library. From the 92% of the respondents who agreed that digital resources were available, majority 68.42% said that the digital resources were inadequate while 31.58% said that the digital resources were adequate.

Availability and adequacy of study materials enhances smooth learning process. However, the study established that the most of the respondents revealed that the digital resources were available but inadequate. One of the respondents said that:

"... Yes, they are available, but they are inadequate therefore, getting access to them becomes difficult especially during examination time when everyone wants to use them". [Respondent 1 from University of Nairobi, July 2021]. This

implies that with the inadequacy of the digital resources for the VI students in the University of Nairobi library is likely to result to poor performance of the VI students. From the data collected, one of the respondents also explained that:

"...Yes, we have few, they are not sufficient since they are few in numbers and the number of visually impaired learners is very large in the institution making the material insufficient. [Respondent 4 from University of Nairobi, July 2021].

The findings of the study from most of the key informants revealed that the equipment available in the University of Nairobi library do not serve all the VI students at ago, this implied that the equipment's are not adequate in the University of Nairobi library. This as well was in agreement to the views of the VI students who said that the digital resources were inadequate.

4.5.2 Ability of VI students to retrieve digital resources without any assistance from their libraries

The finding on the ability of the VI students to retrieve digital resources without any assistance is presented in **figure 4.7.**

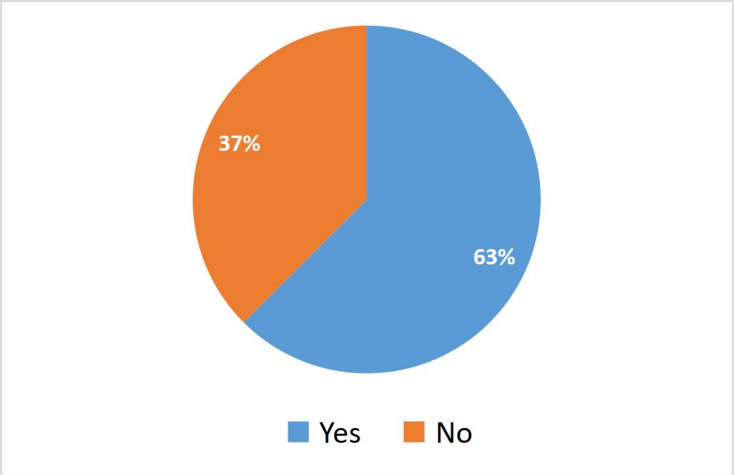

Figure 4. 7: Ability of VI students to retrieve digital resources without any assistance from their libraries

Source: Researcher, 2021

The findings shows that majority 62.5% of the respondents were able to retrieve digital resources on their own without any assistance while 37.5% were unable to retrieve digital resources without assistance.

4.5.3 Technologies often used to access digital resources by VI students

The researcher opted to establish some of the technologies most often used by VI students in the University of Nairobi. The findings of the study are presented in **table 4.6**.

From the analysed data, majority 10(55.56%) of the VI students revealed that they used computers connected with internet. Similarly, 4(22.22%) of the respondents revealed that they use Job Access with Speech (JAWS) to access digital resources, while equivalent number 4(22.22%) said that they use installed sound devices that can spell words.

Table 4. 5: Technologies often used by VI students to access digital resources

Technologies often used to access digital resources by VI students	**Frequency**	**Percentage (%)**
Job access with speech (JAWS)	4	22.22
Sound devices installed that can spell the words	4	22.22
Use of computers connected with internet	10	55.56

Source: Researcher, 2021

Internet and digitalization have made the library worldwide to look like a global village, whereby you can retrieve any information within a shorter duration of time. Similarly, majority of the VI students from University of Nairobi revealed that use of

the internet helps them a lot to retrieve information from digital resources without any assistance. One of the respondents said that:

"*...I use internet most of the time because it contains a lot of information necessary for learning...I use short time because it is very fast and limited time is required to access the digital resources".* [Respondent 4 from University of Nairobi, July 2021].

Use of devices installed with audio was available and mostly relied by the VI students to access information on their own. One of the respondents explained that:

"... with the use of screen reader/speech synthesizer which is able to provide auditory feedback when using the keyboards as well as auditory access to information display on the monitor, these systems consist of a software program and speech synthesizer which information from the computer to the synthesizer where phonemes are combined into words and the words are spoken and within a very short time you're able to access your digital resources". [Respondent 22 from University of Nairobi, July 2021].

From the findings where majority of the respondents revealed that the digital resources were available, one of the VI students from University of Nairobi revealed that they are able to retrieve information without any assistance. One of the respondents gave the following views:

"...I use a Job Access with speech (JAWS) it is a software that facilitates access to the information displayed on computer screen through text to speech. It enables me access to the information displayed on the screen, I can listen to the information through the headphone or get the printouts through Braille Printer for its reading. JAWS is installed in the computers found in our library because it is expensive and unaffordable for blind people at individual level. I am able to complete

my work within the scheduled time using this software is very convenient". [Respondent 1 from University of Nairobi, July 2021].

The findings of the study from the key informants further indicated that the equipment mostly used by VI students were the JAWS, Computers and Braille. This was also in agreement with the students' views.

4.5.4 Other methods used by VI students besides Technology handle their research work

Table 4.7 provides other methods by VI students besides technology to handle their research work.

Majority 8 (88.89%) of the VI students stated that they get assistance from sighted friend /staff when accessing digital resources with the help of screen readers. One of the respondents which represent 11.11% of the response noted that they use hardbound digital resources available in the library.

The findings also showed that most of those VI students from University of Nairobi who were unable to retrieve information on their own were getting their assistance from friend/ staff when accessing digital sources with the help of screen reader.

Table 4. 6: Other methods used besides technology

Methods used by VI students besides Technology handle research work	**Frequency**	**Percent (%)**
Needs some assistance from friend/ staff when accessing digital sources with the help of screen reader	8	88.89
Hardbound library resources available in the library	1	11.11

Source: Researcher, 2021

The respondent explained that:

"...I request a sighted person to skim the section I want to read the same with help of some screen reader whereby the content from the website must be well coded with proper tags". [Respondent 2 from University of Nairobi, July 2021].

Another respondent added by saying that:

"...I usually go along with a friend who help me but at times I don't find them if I had not informed them on time. At some point if I fail to get assistance I go back". [Respondent 6 from University of Nairobi, July 2021].

Librarians play key role in ensuring that all people who go to the library are accorded all the necessary assistance. Similarly, the VI students from University of Nairobi were getting assistance from the library staff. One of the respondents said that:

"...there is enough assistance from the staff, where they assist in getting digital resource". [Respondent 11 from University of Nairobi, July 2021].

4.5.5 Attendance of training or workshop by VI students on access to digital resources

The researcher found it significant to enquire on whether the VI students from University of Nairobi had attended any training or workshop. The findings are illustrated by **figure 4.8**.

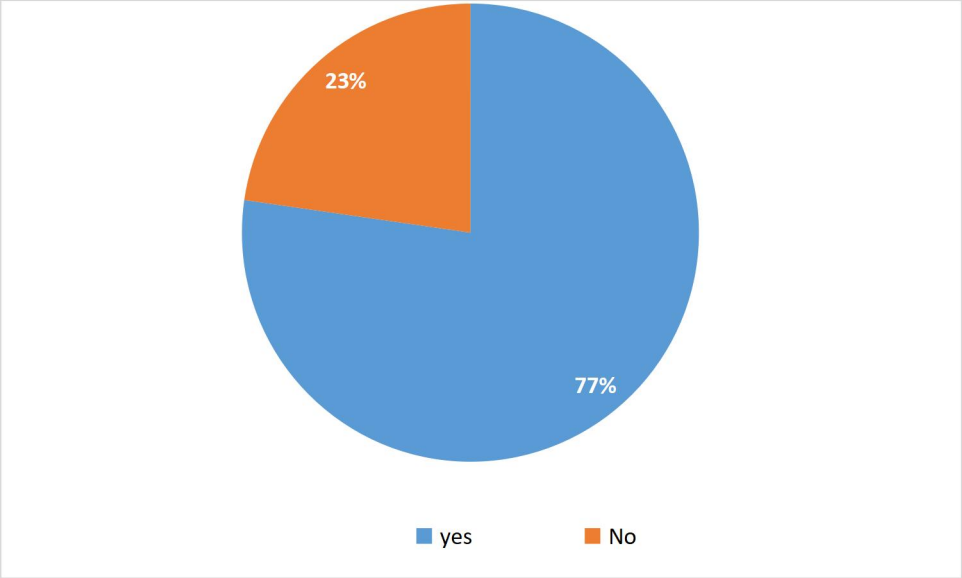

Figure 4. 8: Attendance of training or workshop by VI students on access to digital resources

Source: Researcher, 2021

The results in figure 4.6 showed that most 77.27% of the respondents had attended training or workshops, while 22.73% of the respondents had not attended any training or workshop.

Similarly, most of the key informants (3 out of 5) had attended trainings/workshops. This implied that the key informants had enough skills to enable the accord the necessary assistance to the VI students at the University of Nairobi.

4.5.6 Trainings/workshops attended by VI students

Table 4.8 illustrates the trainings and workshops attended by the VI students from university of Nairobi.

Table 4. 7: Trainings/workshops attended by VI students

Trainings/workshops attended by VI students	Frequency	Percentage (%)
Accessibility and usability of eLearning computers	14	28.57
How to use computers them during research and learning	9	18.37
Tools that help visual learners	11	22.45
virtual learning for visual impaired	5	10.2
ICT training	4	8.16
Remote learning for visual impaired	2	4.08
Use of Audio computers	2	4.08
Safety measures	1	2.04
Orientation on mobility skills	1	2.04

Source: Researcher, 2021

The findings of the study revealed that from the 77.78% of the respondents who had attended trainings/workshops, 28.58% said that they had attended a training on accessibility and usability of eLearning computers, 22.45% attended a training on tools that help visual learners, 18.37% on how to use computers during research and learning. Similarly, 10.2% had attended a training on virtual learning for visually impaired, 8.16% attended ICT training. Additionally, 4.08% of the respondents had both workshop on remote learning for visual impaired while equivalent 4.08% had attended a training on the use of audio computers. Lastly, one of the respondents each had attended a training on safety measures while the other respondent had attended an orientation on mobility skills, this represented 2.04% each of the total population that agreed to have attended a training/workshop.

The study showed that most of the respondents had attended trainings/workshops and it assisted them to learn various ways of using and retrieving information using digital resources. One of the respondents said that:

"...Yes, I have attended various trainings and workshops inside the school and outside the school during holidays. This enabled me to access the digital resources effectively. Some of the trainings I received were on basic computer and networking information. I also got trained on how to collect, store and retrieve information". [Respondent 7 from University of Nairobi, July 2021].

Another respondent added that:

"...the training was how to navigate and access digital resources without much assistance and how to know the specific areas that one need to get information from digital resources without taking a lot of time". [Respondent 11 from University of Nairobi, July 2021].

Moreover, one of the respondents added that:

"...yes, I have attended once it was conducted at Mombasa and we were taught of many digital resources which can help us out, for example there is an app called KNFB reader where one can take pictures of a print letter and my phone will read it out loud within a matter of second". [Respondent 17 from University of Nairobi, July 2021].

Further, from the findings, one of the key informants noted that:

"...the training was how to use the assistive technology and how relevant are we to the visually impaired towards accessing the information in the library...the training was relevant because we were able to understand better the situation of the visually impaired students though it was short, we were able to capture everything". [Key informants from University of Nairobi, July 2021].

4.5.7 Purpose on which VI students use digital resources in library

The findings on the purpose on which VI students use digital resources in University of Nairobi is presented in **figure 4.9.**

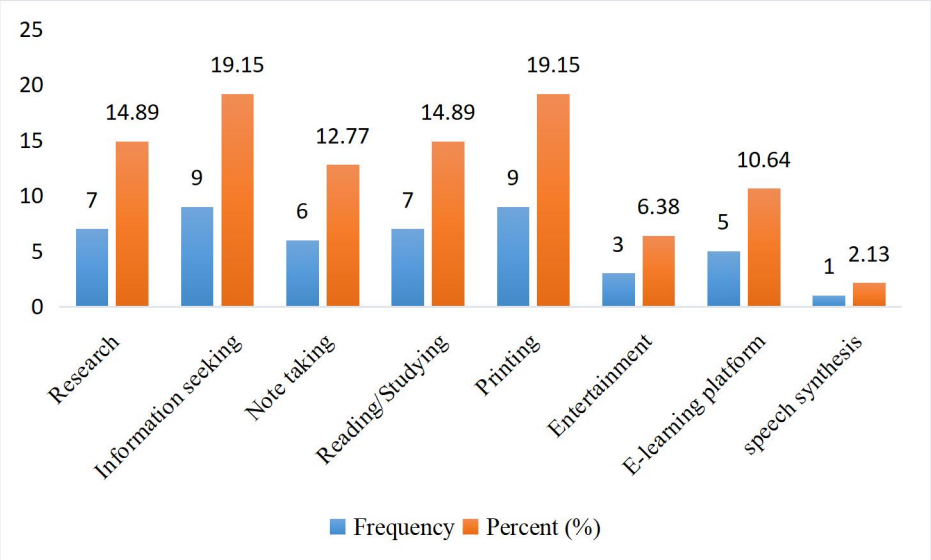

Figure 4. 9: Purpose on which VI students use digital resources in library

Source: Researcher, 2021

The findings of the study showed that majority of the respondents use the digital resources in the University of Nairobi library for printing and seeking information, this represented 38.30% of the total population, 19.15% each. It was followed by 29.78% of the respondents who stated that they use the digital resources for reading and research purposes, this represented 14.89% of each of the response. Further, 12.77% said that they used the digital resources for taking notes while 10.64% said that they used it for e-learning. Similarly, 6.38% said that they used it for entertainment purposes. One of the respondents which represent 2.13% of the respondents used the digital resources for speech synthesis.

Digital resources make the retrieval of information more convenient and faster. The finding revealed that most of the VI students at the University of Nairobi used the digital resources to seek information, reading and research purposes. One of the respondents said that:

"...through the access of the internet, I am able to access electronic books, electronic journals, electronic dictionaries and electronic encyclopaedias to acquire new information as well as for research purposes. After acquiring the intended information, I retrieve it and store it for future reference". [Respondent 7 from University of Nairobi, July 2021].

Another respondent who added that:

"...we normally access online resources for academic purposes, doing our assignments and research purposes by use of assistive technologies such as "modified computer keyboards, audio web browsers and screen readers with speech or Braille output, provide access to digital resources for visually impaired people". [Respondent 22 from University of Nairobi, July 2021].

This implies that majority of the visually impaired students from the University of Nairobi relied on the digital information resources in information seeking.

4.6 Challenges that are faced by visually impaired students when accessing the digital resources

The third objective of the study was to identify the challenges that are faced by the visually impaired students when accessing the digital resources. The questions underlying this objective are: What problem do you encounter while seeking for information? How do you normally solve this problem? The questions were asked to all respondents.

4.6.1 Problems encountered by VI while seeking for information

The study went further to investigate the problems that are encountered by VI students, the findings are illustrated in table 4.8.

Table 4. 8: Problems encountered by VI while seeking for information

Problems encountered by VI while seeking for information	**Frequency**	**Percent (%)**
Failure to see facial expressions	3	4.35
Slow in grasping information/typing	9	13.04
Lack of digital skills	6	8.7
Lack of appropriate knowledge by librarians	9	13.04
Inadequate Braille's/Limited learning materials	13	18.84
Mobility problems	3	4.35
High cost of data/Financial challenges	7	10.14
Poor network	5	7.25
Negative attitude from other peers	7	10.14

Small learning space	3	4.35
Lack policy on inclusive setting of institutions	2	2.9
Some computers are not user friendly	2	2.9

Source: Researcher, 2021

The findings revealed that VI students were encountering various problems. Majority of the students 13(18.84%) said that inadequacy of Braille's/limited learning materials was the major problem. It was followed by 9 (13.04%) of the respondents noted that they were slow in grasping/typing information, similar percentage 13.04% said that lack of appropriate knowledge by librarians was the major problem that they were facing. The respondents 7(10.14%) also revealed that negative attitude from their peers was one of the problems they were facing, similar number 7(10.14%) said that high cost of data/financial challenges was the major problem they were facing. 8.70% of the respondents said that lack of digital skills was one of the problems they were facing. Small learning space (figure 4.10), failure to see facial expressions and mobility problems was one of the problems they were facing.

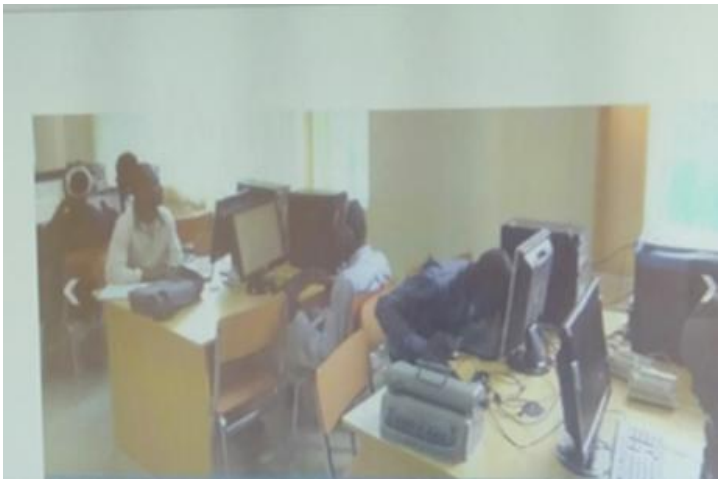

Figure 4. 10: Learning space in the Library for VI students

Five of the respondents, who represented 7.25% of the respondents said that the main challenge they encountered is poor network. Likewise, 6(8.70%) of the respondents

said that small learning space and mobility problems was the challenges they mostly encounter. Finally, 4(5.80%) of the VI students said that the main problem they encountered was lack of clear policy on inclusive setting of institutions and having some of computers in the library that are not user friendly.

From the findings of the study, most VI students were unable to access information due to; negative attitude from other peers' inadequacy of learning materials and lack of digital skills. One of the respondents said that:

"...first, I am less likely to attend library because I lack interest in it and I am very slow in grasping several concepts, I need a lot of time to review over and over for me to capture something, ...secondly, our staff are reluctant and may not or are less willing to help us retrieve information from digital resources which is so discouraging". [Respondent 9 from University of Nairobi, July 2021].

Further findings revealed that poor internet connection, and sitting space is the main challenge encountered. A respondent stated that:

"...sometimes the internet connection usually disturbs, it is usually difficult to identify what the problem is ...also the search usually gives a lot of information which some are not useful without a friend it is difficult to notice and identify...the access points are sometimes full hence it takes time waiting for one to complete". [Respondent 6 from University of Nairobi, July 2021].

Similarly, another responded explained that:

"...first, I have difficulties with pages having images and other non-textual elements without alternative texts, especially when those images are used as links, so I may not know if the information in the link is important or not...second, some information have functions that are controlled by a mouse, such information may not be useful to me because being Visually Impaired user, I cannot use the

mouse...thirdly, some information have non-described tables, poor contrasts and badly chosen colours that maybe very difficult for me". [Respondent 16 from University of Nairobi, July 2021].

Findings also showed that most of the VI students were wasting a lot of time and attending the same class with sighted students troubles them a lot. One of the respondents said that:

"... The greatest problem I face is that I cannot see facial expressions and this is a huge piece of information that is missing when trying to understand a situation...I am slow in grasping some content and this needs much of my time because I have to review the content several times". [Respondent 1 from University of Nairobi, July 2021].

The findings from the questionnaire of the key informants stated the following challenges faced by VI students while accessing digital resources; unavailable digital content in Braille(BRL) format, availability of some scanned content in form of pdf which is unreadable by screen readers, the computers available in the library contain only the basic narrator software that is very limited, library space is concentrated with the resources used by sighted students making the VI students to feel side-lined, inadequacy knowledge on assistive technology as most of the VI students are admitted without skills on technology, negative attitude towards their disability and they consume a lot of time since they are slow in grasping information.

Most of the challenges outlined by the key informants were in agreement with most of the VI student's views. Bearing in mind that Nairobi University is the largest University in the country, its inability to have well equipped library in terms of space, equipment, and manpower to assist VI students draws a bad image. This implies that

much needs to be done in libraries so as to accommodate more VI students in terms of space and resources.

4.6.2 Ways normally used by VI students to overcome the problem on digital resources

The researcher interrogated the VI students so to get their opinions on the ways they normally use to overcome the problem on digital resources. The findings of the study are illustrated in table 4.9.

The study showed that majority 14(38.89%) of the respondents were getting assistance from their friends who were not VI, followed by 5(13.89%) who said that they overcome the problem by getting assistance from librarians, similar number 5(13.89%) of the respondents said that they overcome the problem of study space by looking for enough space to conduct their program. The findings also indicated that 3(8.33%) of the respondents who were getting negative views from their peers said that they overcome the problem by getting encouragement from their parents, guardians, close friends and even their tutors. A similar number of respondents 3(8.33%) revealed that they relied majorly on getting information from internet or learning from the use of internet. A total number of 6 respondents who represented 16.68% of the respondents' views said that they relied on audiobooks, use of information from books rather than the internet, and finally by consulting their tutors. From the findings it implies that VI students relied mostly on their friends who are sighted to overcome most of the challenges they come through, and that sighted students plays a major role in the betterment of the study life of the VI students.

Table 4. 9: Ways normally used by VI students to overcome the problem on digital resources

Ways normally used by VI students to overcome the problem	**Frequency**	**Percentage (%)**
Consulting tutor	2	5.56
Help from friend who are not VI	14	38.89
Looking for enough space to conduct the program	5	13.89
Encouragement	3	8.33
Use internet	3	8.33
Use of books that contain information rather than internet	2	5.56
Help from librarians	5	13.89
Use of audiobooks	2	5.56

Source: Researcher, 2021

Most of the respondents revealed that the only convenient way of overcoming many of the problems they encounter is getting assistance from close friends or getting help from tutors. One of the respondents said that:

"...in many occasions I prefer consulting my tutor whenever he/she is around or access the information with a friend who is not visually disabled so that we exchange ideas and gain better understanding". [Respondent 1 from University of Nairobi, July 2021].

Another respondent added that:

"...many a times I prefer going to the library with one of my sighted friends so that we exchange ideas and help me access to other information". [Respondent 9 from University of Nairobi, July 2021].

Further on the ways under which the VI students from university of Nairobi explained that:

"...I normally look for a sighted person who can help me move around the library without struggle ...I also use my white cane which helps me move independently. Also, I use the skills I have to get information I need though at times it becomes tricky in a way". [Respondent 2 from University of Nairobi, July 2021].

4.7 Proposed possible strategies to mitigate the challenges that VI students face while accessing the digital resources.

The fourth objective of this study was to propose possible strategies to mitigate the challenges that VI students face while accessing the digital resources. This objective was guided by one research question that was asked all respondents that participated in the study. The research question was; what should be done to improve the situation?

4.7.1 Proposed solutions to problems faced by VI students in libraries

The researcher also sought to get the opinions of the respondents on some of the proposed solutions to the problems they were facing in university of Nairobi libraries. The analysed results of the study are presented in table 4.10.

From the findings of the study majority 12(24%) of the respondents suggested that increasing braille machines/learning materials/digital resources for VI students will be one of the major solutions to the problems they face. Similar number of respondents 12(24%) suggested that employing trained librarians will enable them to overcome the problems they were facing since they believed that most of the librarians did not have enough knowledge on VI. The findings also shows that 6(12%) of the respondents proposed that equipping more reading resources with sound will help them to overcome the challenges there are facing. Further, 5(10%) respondents suggested that making the study environment adaptive for VI students or ensuring that

policies that are friendly to the disabled will enable them to overcome most of the challenges they encountered. With the high cost of internet some of the respondents suggested that installing Wi-Fi in libraries for learners will be one of the solutions to the problems of poor network they were facing.

Table 4. 10: Solutions to problems faced by VI students in libraries

Solutions to problems faced by VI students in libraries	**Frequency**	**Percent (%)**
VI students to attend library frequently	1	2
Employing trained librarians	12	24
Organize seminars	3	6
Install Wi-Fi in libraries for learners	4	8
Increase Braille machines/Learning materials for VI/digital resources	12	24
Making the environment adaptive for the VI/Ensure that policies are friendly to the disabled	5	10
Educating learners on how to use digital resources for learning	2	4
Support from the government in terms of finances on VI	2	4
Adequate space in the library	3	6
Equip more reading resources with sound	6	12

Source: Researcher, 2021

Additionally, 3(6%) of the respondents suggested that provision of adequate space in the library for the disabled students will assist them to overcome the challenges on study space within the libraries. Similar number of respondents 3(6%) suggested that organize seminars/workshops for the VI students will assist those VI students who are unable to cater for outside seminars/chores because of financial challenges. The respondents also suggested that educating VI learners on how to use digital resources

for learning, and getting support from the government in terms of finances on VI will help them to overcome inadequacy of knowledge on digital resources financial problems, this represented 4(8%) of the respondents. Lastly, one respondent which represented 2% of the respondents' views suggested that VI students should attend library frequently so as to get conversant with various learning resources in the library. Various strategies were proposed by the respondents to improve on the challenges they encounter when accessing digital resources. One of the respondents proposed that:

"...ideally, I would wish that our school employ some trained librarians to help us find a wide variety of information in the library, I feel like there is no much attention given to services for us blind users, such as talking books, in the curriculum. Because, many of our librarians are not trained in the needs of students who are blind or otherwise disabled. The number of the assisting digital resources should be increased to allow easy access by learners". [Respondent 1 from University of Nairobi, July 2021].

Another respondent further added that:

"...Organize seminars whereby I can get training and get the necessary skills. Also, get trained personnel who is able to assist me well in getting the braille instruction, ensure that the braille materials needed are sufficient. Also, making the environment adaptable for the blind learners to be able to move freely without struggle, so that I can access the library more easily and efficiently". [Respondent 22 from University of Nairobi, July 2021].

The findings of the study from the key informants proposed the following solutions to the challenges encountered by VI students at the University of Nairobi in accessing digital resources. Frequent training the library staff on the use of adaptive/assistive

technology, dedicating a section of the library workforce to serving students with disabilities, implementing the existing policies effectively, and those institutions should employ expertise who are able to understand the VI students effectively.

4.8 Observed the available adaptive/ assistive technology in place

The researcher observed the inadequacy of space at UON library figure 4.10. There was no correlation of infrastructure per visually impaired student as observed. The number of computer with assistive technology available at the institution generally serves a smaller population of visually impaired students. This was because there was no special library for the visually impaired they have a section within the main library that serves both the sighted and visually impaired students. From the observation the assistive technology in place was available but inadequate this includes among them: braille reader, magnifiers and JAWS with fusion figure 4.5 and 4.6. The study found out that majority of the participant have the skills to use the assistive technology in place as well as navigate the system and access the digital information resource.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This is the last chapter and will present summary of the research findings, the conclusions and recommendations based on the study's findings on information seeking behaviour on digital resources by visually impaired students at the university of Nairobi library services, Kenya.

5.2 Summary of the findings

The study aimed at establishing information seeking behaviour on digital resources by visually impaired students at the university of Nairobi library services, Kenya. From the findings of the study, the following were established.

From a total of 38 questionnaire that were administered to the respondents, a total of 30 questionnaire were found to be valid, this constituted 78.94% and was considered adequate for the study.

On the general information of the respondents, it was found that most of them were female, a total of 20 out of 30 from both the VI students and the key informants. Majority were 23years old followed by those that were 22 years old while those at 28years were the least in number. It was also revealed that majority with a small margin of the VI students were part-time students. Regarding the level of study, most of the VI students were in their third and fourth year of study.

From the first objective of the study on establishing information seeking behaviour by students with VI in accessing digital resources, the following were found. That, most of the VI students believed that getting information on how to use aiding materials such as braille books, white cane and handheld magnifiers will support the learning

which in turn better their learning process. It was followed by those VI students who revealed that getting information on to use computers to search information, reading and doing their assignments and research will support their learning at a higher extend. The findings were in agreement with those of the key informants who noted that they need to know the vision level of the students, students' knowledge on the use of assistive technologies like braille and the attitude towards visual disability will better their ability to use digital resources. The findings further established that most of the VI students believed that provision of screen readers/speech synthesizer, Braille, and Digital computers are most commonly needed equipment by VI students with VI, addition al equipment's were; Optical Character Recognition (OCR), Magnifiers, human readers, audio cassettes, headphones, electronic texts, and audiobooks.

Regarding the ways through which VI students search of information in libraries, the following ways were revealed; majority of the VI students were finding it hard to search for information in the library not unless they get assistance from a sighted person who can be their friends or the librarians. Other ways include; use of computers and search engines/web browsers, use of speech synthesizers, use of screen readers, brail prints, audio books and by the help of orientation mobility skills and use of mobile app called Tap Tap.

From the second objective of study on how existing assistive technology impact VI students in accessing digital information resources. The finding revealed that; majority of the respondents agreed that digital resources for VI students were available in their libraries while a smaller number said that the digital resources were not available in their libraries. Further, most respondents said that they were able to retrieve digital resources on their own without any assistance. The technologies that were used by VI who needed no assistance include; the use of computers connected

with internet followed by use Job Access with Speech (JAWS) to access digital resources and finally use of installed sound devices that can spell words. The other methods used besides technologies were; assistance from sighted friend /staff when accessing digital resources with the help of screen readers and the use hardbound digital resources available in the library.

Regarding attendance of training/workshops by VI students; most of the VI students had attended training or workshops. Similarly, the findings revealed that most of the key informants (3 out of 5) had attended trainings/workshops as well. These trainings/workshops include; training on accessibility and usability of eLearning computers, training on tools that help visual learners, how use computers during research and learning, training on virtual learning for visually impaired, training on the use of audio computers, training on safety measures and an orientation on mobility skills.

Furthermore, the study established the purpose on which VI students use digital resources in the library. The following responses were noted; majority used the digital resources in the University of Nairobi library for printing and seeking information, followed by those who used it for reading purposes, research purposes, taking notes, e-learning and lastly for entertainment purposes.

The third objective of the study was to establish challenges that faced VI students when accessing digital resources. The following findings were noted; on the problems encountered by VI students, Majority of the VI students said that inadequate of Braille/limited learning materials was the major problem. Other problems are; slowness by VI students in grasping/typing information, lack of appropriate knowledge by librarians on VI students, negative attitude from their peers, high cost of data/financial challenges, lack of digital skills by VI students, small learning space,

failure to see facial expressions and mobility problems was also one of the problems they were facing. Likewise, poor network, lack of clear policy on inclusive setting of institutions and having some of computers in the library that are not user friendly were the problems encountered by the VI at the University of Nairobi library.

Regarding ways that were normally used by VI students to overcome the problem on access to digital resources include; getting assistance from their friends who were not VI, getting assistance from librarians, looking for enough space to conduct their program, getting encouragement from their parents, guardians, close friends and even their tutors. Additionally, respondents revealed that they relied majorly on getting information from internet or learning from the use of internet, relying on audiobooks, use of information from books rather than the internet, and finally by consulting their tutors.

The fourth objective was aimed at establishing proposed possible strategies to mitigate the challenges that VI students face while accessing digital resources. From the findings of the study, the following strategies were established; majority of the respondents suggested that increasing braille machines/learning materials/digital resources for VI students in the library will be one of the main solution, other respondents suggested that employing trained librarians, equipping more reading resources with sound devices, making the study environment adaptive for VI students or ensuring that policies that are friendly to the disabled will enable them to overcome most of the challenges they encountered. With the high cost of internet some of the respondents suggested that installing Wi-Fi in libraries for learners will be one of the solutions to the problems of poor network they were facing. Additionally, the respondents suggested that provision of adequate space in the library for the disabled students will assist them to overcome the challenges on study space within the

libraries, also respondents suggested that organizing seminars/workshops for the VI students will assist those VI students who are unable to cater for outside seminars/workshops because of financial challenges. The respondents also suggested that educating VI learners on how to use digital resources for learning, and getting support from the government in terms of finances on VI will help them to overcome inadequacy of knowledge on digital resources financial problems. Lastly, respondents further suggested that VI students should attend library frequently so as be conversant with various learning resources in the library.

5.3 Conclusions

From the findings of the study, the following conclusions were made regarding the information seeking behaviour on digital resources by visually impaired students at the university of Nairobi library services, Kenya.

The study revealed that the most commonly available assistive/ adaptive technology often used to access digital resources includes; computers, braille, screen readers, human readers, JAWS, magnifiers, audio cassettes, headphones, electronic texts, and audiobooks for VI students. However, these equipment's/learning materials were inadequate and provision of more of the equipment's for the VI students was suggested so as to better the learning of VI students.

Regarding the ways through which VI students search of information in library majority of the VI students were finding it hard to search for information in the libraries not unless they get assistance from a sighted person or by use of computers/search engines/web browsers, use of speech synthesizers, use of screen readers, brail prints, audio books and by the help of orientation mobility skills and use of mobile app called Tap Tap.

Regarding attendance of training/workshops by VI students; most of the VI students had attended training or workshops. The trainings/workshops include; training on accessibility and usability of eLearning computers, training on tools that help visual learners, how use computers during research and learning, training on virtual learning for visually impaired, training on the use of audio computers, training on safety measures and an orientation on mobility skills. The study concluded that organizing more trainings/workshops within the University of Nairobi for the VI students will better the information seeking behaviour of the VI student since some of them were not able to afford those training/workshops held outside the university.

The study also revealed that majority of the VI students used the digital resources in the University of Nairobi library for printing, seeking information, reading purposes, research, taking notes, e-learning and for entertainment purposes.

From the findings the following were the challenges faced by VI students; inadequate Braille/limited learning materials was the major problem, slowness by VI students in grasping/typing information, lack of appropriate knowledge by librarians on VI students, negative attitude from their peers, high cost of data/financial challenges, lack of digital skills by VI students, small learning space, failure to see facial expressions, mobility problems, poor network, lack of clear policy on inclusive setting of institutions and having some of computers in the library that are not user friendly were the problems encountered by the VI at the University of Nairobi library.

5.4 Recommendations

The following recommendations were made regarding information seeking behaviour by visually impaired students at the university of Nairobi library.

5.4.1 Recommendations from the findings of the study

First the respondents recommended that the university increase braille machines/learning materials/digital resources for VI students in the library so as to ensure that all the VI students can get equal access of the digital resources during learning and examination period.

The respondents also suggested that library management to have a continuous training on the existing librarians so as to equip them with enough and current technological skills on both VI students and disabled students that will give them a better understanding on the usability of the equipment available.

Additionally, the respondents suggested that equipping the reading resources with sound devices will better their information seeking behaviour since most of them often request their sighted friends to read for them which is quite challenging at times when the friends aren't available.

Furthermore, the respondents recommended that making the study environment adaptive for VI students or ensuring that policies that are friendly to the visually impaired students will enable them to overcome most of the challenges they encountered like inadequate sitting space and some of the sighted students occupying their sitting space which at times make them go back to their rooms due to inconvenience.

Lastly, on the issue of high cost of internet some of the respondents recommended that installing Wi-Fi in library for learners will be one of the solutions to the problems of poor network they were facing.

5.4.2 Recommendations for future research

The study assessed information seeking behaviour on digital resources by visually impaired students at the University of Nairobi library services, Kenya. Due to the

Covid-19 restrictions and some key issues that arose from the findings of the study, the followings are recommendations for future studies were made.

1. A similar study needs to be done for different Universities especially younger Universities since University of Nairobi is ranked among the best academic universities in Kenya, that's according to UniRank 2020 and still faces major challenges.
2. A comparative study to be done on VI students from private and public Universities on information dissemination.

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APPENDICES

APPENDIX I: APPLICATION FOR RESEARCH PERMIT

MAASAI MARA UNIVERSITY
(OFFICE OF THE DIRECTOR, POSTGRADUATE STUDIES)

TEL. No.0722346 419 P. O. Box 861-20500
Email: graduatestudies@mmarau.ac.ke NAROK, KENYA

Ref/MMU/AA0328/45/ VOL 1 (65) Date: 21st June, 2021

Council Secretary,
National Council for Science and Technology,
P.O. Box 30623-001 OO
NAIROBI-KENYA

Dear Sir/Madam,

RE: APPLICATION FOR A RESEARCH PERMIT FOR: PRISCAH CHEPTOO KIRWA ,REG. NO. SM06/MP/MN/8245/2018.

I wish to recommend the above candidate for a permit to enable her collect data for her research. She defended her proposal at the School of Science and Information Science successfully and has made the necessary corrections. The title is "Information Seeking Behaviour on Digital Resources by Visually Impaired Students at the University of Nairobi Library Services, Kenya. " She therefore qualifies for a permit to conduct research.

Any assistance accorded to her will be highly appreciated.

Thank youRA UNB/ER${

MAASAI MARA UNIVERSITY
P. O Box 861 - 20500
NAROK
RAmlw
21 JUN 2021

Prof. Romulus Abila
DIRECTOR-BOAE

Abila.P
DI RTBOARD POSTGRADUATE STUDIES
BOARD OF
POSTGRADUATE GTU

APPENDIX II: NACOSTI LETTER

REPUBLIC OF KENYA

NATIONAL COMMISSION FOR SCIENCE,TECHNOLOGY & INNOVATION

Ref No: 416935

Date of Issue: 02/July/2021

RESEARCH LICENSE

This is to Certify that Miss.. Priscah Cheptoo Kirwa of Maasai Mara University, has been licensed to conduct research in Nairobi on the topic: INFORMATION SEEKING BEHAVIOR ON DIGITAL RESOURCES BY VISUALLY IMPAIRED STUDENTS AT THE UNIVERSITY OF NAIROBI LIBRARY SERVICES, KENYA, for the period ending : 02/July/2022.

License No: NACOSTI/P/21/11548

416935

Applicant Identification Number

Director General
NATIONAL COMMISSION FOR SCIENCE, TECHNOLOGY & INNOVATION

Verification QR Code

NOTE: This is a computer generated License. To verify the authenticity of this document, Scan the QR Code using QR scanner application.

APPENDICES APPENDIX III: QUESTIONNAIRE FOR VI STUDENTS
INFORMATION SEEKING BEHAVIOR ON DIGITAL RESOURCES BY VISUALLY IMPAIRED STUDENTS AT THE UNIVERSITY OF NAIROBI LIBRARY SERVICES, KENYA.

QUESTIONNAIRE FOR VI STUDENTS
Introduction letter
Dear Student,
RE: request to participate in questionnaire for master's research project

I am a master's student at Maasai Mara University conducting a study on information seeking behaviour on digital resources by visually impaired students at the university of Nairobi library services, Kenya. I have selected you as one of my respondents in data gathering because you are the best suited candidate. I will appreciate if you assist me to achieve the intended goal by filling the attached questionnaire. The questionnaire will take you very limited time to complete. The information provided will only be used for the purpose of this study and will be treated with utmost confidentiality. Thank you for your time and cooperation.

Priscah Cheptoo Kirwa

Email address: priscahkirwa@gmail.com

SECTION A GENERAL INFORMATION
Please tick appropriately.

Gender: Male ( ) Female ( )

- **Age:**

  Below 20 yrs ( )

  21yrs- 25 yrs ( )

  26 yrs- 30yrs ( )

  31yrs- 35yrs ( )

Above 35yrs ( )

- **Level of Study:**

year 1 ( )

Year 2 ( )

Year 3 ( )

Year 4 ( )

Year 5 ( )

Masters ( )
PHD ( )

Category of study: Full time student ( ) part time student ( )

SECTION B INFORMATION SEEKING BEHAVIOUR

1. What information do you need to support your learning?
   ……
   ……..
2. What equipment do you mostly need to enable you to get information for you to learn effectively?
   ……
   ……
3. How do you search for information in your library?

   .....

SECTION C ASSISTIVE TECHNOLOGY

PART A
Are there digital resources in your library and how sufficient are they in your library
……
……
……
Are you able to access and retrieve digital resources without any assistance?

YES NO

PART B
If YES which technology do you often use to access to digital resources and how long do you take

……
……

PART C

If NO how do you handle your research work

……
……

PART D

Have you ever attended training or workshop on access to digital resources?

.....
.....

PART E

What was some of the training?

.....
.....

PART F

How do you use your digital resources for visually impaired in your library?

.....
.....…

SECTION D CHALLENGES

1. What problem do you encounter while seeking for information?

   .....
   .....
2. How do you normally solve this problem?

   .....
   .....
3. What should be done to improve the situation?

   ……
   …….

Thank you very much for your time.

APPENDICES APPENDIX IV: QUESTIONNAIRE FOR KEY INFORMANTS
INFORMATION SEEKING BEHAVIOR ON DIGITAL RESOURCES BY VISUALLY IMPAIRED STUDENTS AT THE UNIVERSITY OF NAIROBI LIBRARY SERVICES, KENYA.

QUESTIONNAIRE FOR KEY INFORMANTS

Introduction letter

Dear Staff,

RE: request to participate in questionnaire for master's research project

I am a master's student at Maasai Mara University conducting a study on information seeking behaviour on digital resources by visually impaired students at the university of Nairobi library services, Kenya. I have selected you as one of my respondents in data gathering because you are the best suited candidate. I will appreciate if you assist me to achieve the intended goal by filling the attached questionnaire. The questionnaire will take you very limited time to complete. The information provided will only be used for the purpose of this study and will be treated with utmost confidentiality. Thank you for your time and cooperation.

Priscah Cheptoo Kirwa

Email address: priscahkirwa@gmail.com

SECTION A GENERAL INFORMATION

Please tick appropriately.

Gender: Male ( ) Female ( )

- **Age:**

Below 20 yrs ( )

21yrs- 25 yrs ( )

26 yrs- 30yrs ( )

31yrs- 35yrs ( )

Above 35yrs ( )

- **Level of education:**

Year 1 ( )

Year 2 ( )

Year 3 ( )

Year 4 ( )

Year 5 ( )

Masters ( )
PHD ( )

- **Job Group:** ……

- **<u>SECTION A: INFORMATION SEEKING BEHAVIOUR</u>**

1) What information do you need to support the visually impaired learners?

……

2) How do your visually impaired students search for digital information in the institution library?

……..

3) When do visually impaired students in this university often seek assistance during the semester?

…….

4) How do you gauge the visually impaired students in terms of accessing the digital resources.(respond for each level of study ie 1st -4th year)

……

5) Which area of the study do the VI students frequently access the digital resources

……

6) Do you conduct library orientation to the VI students?

……

7) Which area do you cover and what response do you get from the student.

……

SECTION C ADAPTIVE AND ASSISTIVE TECHNOLOGY

1. What are the some of equipment that are mostly used by visually impaired students in accessing digital resources in UON library?

……

2. Do the digital resources in your library serve all the VI students at ago.

YES NO

If no what are some of areas that need to be improved and how do you handle the extra students.

……

3. How do the adaptive and assistive technology impact the VI students' performance?

……

4. Have you ever attended any training

YES NO

If yes list some of the training that you have attended and explain the theme.

……

5. How relevant was the training in terms of assisting the VI students.

……

SECTION D CHALLENGES

1. Explain some of the challenges that the VI students face while accessing the digital resources

   ……

2. What challenges do you encounter in serving students with visual impairment especially in the retrieval and use of digital resources through the use of adaptive/assistive technology?

   …….

3. What are the possible solution for question 1 and 2 above?

   ……

Thank you very much for your time.

APPENDICES APPENDIX V: OBSERVATION PROTOCOL

The following point was used as a framework for field notes when observing information seeking behaviour of VI students' performance. It was 2 hours in length and covered all aspects of the guide.

Date……

1. Observe the available adaptive technology in place and the VI student library.

.....

.....