ADDIS ABABA UNIVERSITY

SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF SPECIAL NEEDS EDUCATION

ACCESSIBILITY OF ASSISTIVE SOFTWARE AND HARDWARE TECHNOLOGIES TO PEOPLE WITH VISUAL IMPAIRMENT CASE OF ADDIS ABABA UNIVERSITY

BY:

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ACRNOMYS

AAU:	Addis Ababa University
ATCB:	Adaptive Technology Centre for the Blind
DAISY:	Digital Accessibility Information System
EICTDA:	Ethiopian Information Communication Technology Development Agency
ENAB:	Ethiopian National Association of the Blind
GO:	Government Organization
MOLSA:	Ministry of Labour and Social Affaires
NGO:	Non Governmental Organization
PWD:	Person with Disability
PWVI:	People with Visual Impairment
SPSS:	Statistical Package for Social Science.
SWVI:	Student with Visual Impairment
WWW:	World Wide Web

Abstract

Until recently the student with visual impairment have had a very restricted access to the information on World Wide Web (www). However after the text-to-speech software (screen reader) comes into being, the situation has significantly changed for the better. Therefore this research was carried out to investigate the accessibility of assistive hardware and software technology to the student with visual impairment at Addis Ababa University. The research instruments were questionnaires and an interview questions that were designed to investigate situations how currently SWVI at Addis Ababa University use the technologies. The methodology applied on this research was a mixed method approach (both qualitative and quantitative). The participant of the study consists of 98 SWVI at Addis Ababa University, the librarians that work at Addis Ababa University library, and an expert at adaptive technology training center for the blind (ATCB).On the study 56 male and 42 female student with visual impairment were participated.

The data collected from the participant through questionnaires was organized and analyzed by SPSS software. The research found out with different results. Male students were found having more access to computer and Internet than female students. Senior students were found more Internet users than freshmen students. There is statistically significant association between the awareness and the computer skill of the student. SWVI lacks awareness about the availability of the technology to the people with visual impairment before joining Addis Ababa University, and even after joining the University. The guidance support provided and the computer skills of the student have statistically significant association. The guidance support provided to SWVI by Addis Ababa University was not adequate. The computer training provided to the SWVI at Addis Ababa University is not adequate due to different reasons, like lack of sufficient qualified trainer, inadequacy of the training room and poor organization of the center. There is shortage of training center on computer in public service to the PWVI in Addis Ababa. The factors like cost computer and internet connection, the limit facilities in the public services on computer training are the major factors that limit the access of student with visual impairment at AAU.

CHAPTER ONE

1. INTRODUCTION

1.1 Background of the Study

Many researchers have written about the ways in which people with disabilities are viewed by non- disabled members of the society. To the case in point, Watson (1998) takes the position that people with disabilities "are portrayed as tragic victims of some unfortunate accident or diseases as people who do not function normally"

Hunt (1966) argues, that non-disabled people tend to deny the adjustment people with impairment are capable to make, and assume that they are making the best of a bad job or putting on a good face which some people may be putting on a good face others who are genuinely happy are believed to be un fortunate persons who may have exceptional courage.

According to Gregory (1997) disability is not just about being different but about how the difference is evaluated. As Tirusew (2005) argue if the impairment do not impose or limit the daily activity of a person it should not be considered as disability. This means that the concept of disability is based on the environmental context with in which an individual functions.

According to our society disability may be associated with an inability to perform efficiently certain tasks which have a particular significance for the life and existence of that person. For example a deaf person cannot be considered a person with disability as being deaf does not affect the ability of a person to plough the land and rare animals. The significance is likely to be different across different cultures, just as notion of normal and abnormal are likely to differ according to culture and time period involved (Corker, 1999).

Simpkins (1994) distinguishes between a medical model and a social model of disability, and argues that much research into disability in the past has been flowed because it is wrongly focused .She gives the example of a person with physical disability who is able to use a bus . In the medical model the problem lies with the persons condition preventing him using the bus , where as in the social model the problem is that the design of the bus is the reason why the person cannot access it .In providing assistive technology for information services it is easy to find comparable situation where access to a service is difficult ,not because a person is visually impaired ,but because the design of the service failed to include their needs

Gregory (1997) claims "disability rather than being a biological given can only be understood with in particular social and cultural frameworks". Disability as a social category, defines people by what they cannot do by an ability, which is lacking. It legitimates disempowerment through the social and cultural ways in which expectations of disabled people are different and this affects the ways in which people who are labeled "disabled" come to view themselves and their collective identity.

Technology is embedded in a technical and consumer culture but, for people with a disability, it is also embedded in a culture with particular ideas about disability. This is reflected in the ways in which technology is created only for people with certain abilities (kirsty Williams, Steven wright Don schauder and Amanda Bow, 2001)

When disability labeled as a consequence of biology, the care is to be taken by medical and welfare industries. Responsibility has tended to be taken away form commercial companies to provide technologies which is useful to a broader spectrum needs. As far as economic role of persons with disabilities is concerned, they are considered *"consumers rather than contributors"* to the society's development. This clearly indicates that persons with disabilities are

labeled useless and economically dependents. This negative attitude has adversely affected the equal employment opportunity of persons with disabilities (Abraham, 2001).

Perrett (1995) claimed, "Many companies, particularly those whose products are marketed across the full spectrum of the population considered disabled customers as a niche market at best and an unwanted intrusion at worst. Currently, smaller companies mostly specialize in making adaptive equipment to access mainstream technologies. This affects the cost of adaptive equipment.

Visual impairment is one of the leading disabilities that limit to social interaction and functioning of individual. Visual impairment of all chronic illness and disabilities is the second leading cause of in ability to work (Laplante 1998) with visual impairment being historically correlated with underemployment and poverty (Kitchener 1998).

Integration, independence, participation are the three key words in most countries vision for visually impaired people. However, with out getting access assistive equipment this may be impossible. As such, information technology computer literacy and information access is important to every one in information society, the visually impaired in not excluded (kirsty Williams, etal. 2001).

The success in the information society demands computer literacy education access to public service, internet usage, library service, and e-commerce. Therefore visually impaired individuals must get access to assistive technology for information service to benefit from the opportunities. The research has indicated, that there is a large gap between those, who do have access to assistive technology and, those who do not have access to assistive technology in the process of getting information.

1.2 The Concept of Visual Impairment

Visual impairment can be defined from different points of views. It can be define from medical (clinical), legal, or educational perspectives. Visual impairment could be merely defined as any eye defect, which hampers the educational performance of an individual such that, the individual needs some adaptation and modification in different academic areas. In terms of severity, visually handicapped individuals categorized in to partially sighted (low vision) and blind.

Taylor, Stenberg and Richards (1995) as cited on Anto(2004) defined the two terms (low vision & blind) form educational standpoint as:

a. Partially sighted learners are those having significant visual problems but still use their vision as their primary sense for learning.
b. Blind learners are those whose visual impairment is so sever that they must rely on sense other than vision to function adequately.

Brophy and craven (1999, p.13) quoted "blindness" as to mean unable to perform any work for which eyesight is essential. They state that there is no legal definition for partially sight. The concept of disability is changing; it is likely that most people disabled in their lives. A high proportion of peoples will experience sight problem at some point in their lives. For some peoples this is a life long factor in their lives. Their experience will help many others of us, who may experience sight loss for a shorter part of our lives. It is important to acknowledge that visual impairment is a range of ability not a homogenous group

Individuals with visual impairment because of difficulties in mobility may also become isolated and cut of from families and friends. But the availability of assistive technology has solved the social and educational problem of visually impaired in certain extent.

1.3 Concept of Assistive Technology

Assistive technology is technology used by experts to serve PWI in order to perform functions that might other wise be difficult or impossible. Assistive technology can include mobility device such as walkers and wheel chairs, as well as hard ware software and technologies.

A formal, legal definition of assistive technology was first published in the technology related assistance for individuals with disabilities act of 1998 (The Tech Act) this act was repealed and replaced with the assistive technology act of 1998 ("AT Act").

1.4 Assistive Technology for information service of PWVI

Assistive technologies for information service of PWVI are tools that help people who are visually impaired be more independent at work in school and at home. These tools, which are sophisticated, can make it easier for persons with visual impairment to access printed material, to use computers, to travel and to performance activities of daily living.

Technological design solution for accessibility of persons with visual impairment cannot be identical due to variation in severity of the impairment .For instance, for very blind people text-to-speech synthesizers (or screen readers) that turns text into speech, or retractable or refreshable Braille display to read the text on the site may be ideal design solution. On the other hand, people with limited vision such as tunnel vision or cloud vision asset of other ICT solution such as screen magnifier and extra large screen can enhance accessibility. The literature indicates that, literally thousands of computer products designed to enable peoples with disability have appeared in the last five years, so many that the field of education lacks specialist enough to keep track of them (Marenghi,1991)

Assistive technology incorporates high tech methods. Some examples of assistive technology include:

- Magnification: software to make large –type display and closed –circuit television (CCTVs) monitor to magnify printed matter on a video screen.
- Voice out put :software and hardware that can "read "text aloud
- Alternative input: devices that provide alternatives to standard keyboard and mouse configuration, such as speech recognition, large-key ,key boards, pointing devices and switches that accept wink control ,eyebrow movement, sip-an-puff, tongue or any other body movement.
- Word-processing aid: software that can learn a user's vocabulary and anticipated letters and words

Low vision devices, such as microscopic spectacles magnifiers and telescopes, utilize optical magnification to help visually impaired users achieve their goals. These optical low vision devices are still the staple of low vision care and have certain advantage in comparison to assistive technology.

1.5 Statement of the Problem

Best (1992) claims that it is hard work and tiring to be visually impaired, the impairment can pose in numerable difficulties and limitation on learning activities and access to the computer and online services through WWW. People with visually impaired depends on family members, friends or caregivers to pursue education, and to access to printed materials. However, their counter parts (sighted individuals) can access to this materials in dependently.

The inherent limitations associated with visual impairment are likely to cause challenges to the life of individuals with the problem. Therefore, the purpose of this study is to assess the existing access problem of people with visual impairment to assistive hardware and software technology for their information needs.

1.6. Research questions

This study attempt to give answer to the following research questions

1. Do students with visual impairment have access to assistive software and hardware technology in Addis Ababa university?
2. Do they have computer skill to use assistive software available? If so how do they look like?
3. For what purpose do they use assistive software technology?
4. What are the factors which limit student with visual impairment to use Assistive software technology?

1.7 Objectives of the Study

The main objective of the study is to investigate the significance of assistive hardware and software technology for persons with visual impairment for the need of their information service

Therefore, the specific objective of the study includes:

- To identify accessibility of assistive hardware and software technology for the information need of student with visual impairment at Addis Ababa University.
- To assess the computer skill of students with visual impairment
- To assess the adequacy of guidance and support to persons with visual impairment in using assistive hardware and software technology
- To investigate factors affecting the use of assistive technology for the information need of visually impaired person.

1.8 Significance of the Study

The development of technology had changed the life style of peoples of the world. People with visual impairment and other disabilities are one of those people who benefit from the technologies. Improving access of computer and internet services of PWVI, results in greater social equality. It enables PWVI to

participate in social, economic and political activities at the same level to sighted peoples.

In Ethiopia Tamiru Belay writes about how computer training has enhanced Ethiopians with visual impairment employability and capacity to pursue further education. People with visual impairment required training on computer technology that will enable them to perform their jobs as equally as their counter parts. However, the benefit of ICT has spread unequally especially between disabled and non disabled persons.

Therefore, the researcher assumes that the research conducted will have the following significants.

i. The study tries to explore how SWVI get access to assistive computer technology for their information needs.
ii. The study may create awareness to the government and charity organization who work with visually impaired people in promoting accessible computer technologies.
iii. The study may be used to indicate the problems that limit SWVI to access to computer technologies.
iv. The study may serve as a benchmark for individuals who need further study on this area.
v. It may help policy makers on accessible assistive technologies for PWVI.

1.9 Delimitation of the Study

This study is to explore the roles of assistive hardware and software technologies like computer and Internet service plays in the lives of persons with visual impairment. Hence, this study is covers Addis Ababa University only. The study is limited to the current existing generation of persons with visual impairment in Ethiopia.

CHAPTER TWO

2. Literature Review

2.1 Disability

Most PWDs perceives disability as a personal attribute not as a tragic problem. For many PWDs, the disability is not the single most important self-identifier. Further, the only shared identity of PWDs is the prejudice and discrimination they experience. Other than this devalued position in society it is safe to state that there is no single disability experience. Disability is a natural and ordinary part of life and, certainly, there is a large proportion of the population with disabilities today than before. It seems likely that this number will continue to grow. This is because the modern medicine has increased and decreased the number of individuals with disability.

Disability is a complex term to define because "It is a multi- dimensional concept with both objective and subjective characteristics" (office for Disability issues (ODI) 2002, p.5). In examining the availability or lack of internationally comparable data on disability, Mont (2007) found it difficult to precisely define disability. He opines that there is no single correct definition of disability, because the nature and severity of disability vary greatly. Mohit (2006) even describes disability as cultural bound since various cultures define their norms of disability differently. This coupled with "all forms of misconceptions and negative attitudes" (Tirussew 2005) held in some cultures might have continued to impede a facile under standing of the terms.

Disability refers to the social construction of differences found between people's bodies and/or minds. The physical or mental differences (what some have called impairment) such as the lack of strength in the legs or attention

defiant disorder are not significant in and of themselves. They become significant only in the capacity of societies to accommodate or address these differences. People become disabled when they are unable to function within society. They are not necessarily disabled as a result of their bio-medical condition (Canadian Center on Disability studies 2002).

The literature suggests that while disability is found in all cultures, there is considerable variation in how cultures interpret and address disability. Groce (1999) argues that "the lives of individuals with disability around the world are usually for more limited by prevailing social, cultural, and economic constraints than by specific physical sensory psychological or intellectual impairments". Thus, in her view, the social interpretation of disability is the most important factor affecting people with disabilities and "then the issues of interpretation of disability moves from one of health to one human rights.

However since the academic interest in disability has mirrored the development of actual practice involving the disability movement, organizations of PWDs advocacy groups UN organs, and other stakeholders, it is possible to broadly conceptualize the term. One way in which to conceptualize disability concerns the different models for disability that can be implemented.

A model is a set of guiding assumptions, concepts and propositions about the nature of phenomena or human experience. Models have often been defined as human-made tools for understanding and human-made guidelines for action. As would be expected, treatment and intervention strategies are guided by the type of disability model used.

2.1.1 Medical model of disability

This model employs objective, clear-cut, standardize measures and, as the name suggests, uses experts, such as medical doctors, to provide defining characteristics, causes, prognoses and methods treatment (Fowler & Wades

worch 1991). There are two dimensions of this model normal and pathological, with the diagnosis of normal often defined as simply the absence of any pathology. Drawing on WHO's international classifications two perspectives may be generally identified with medical model of disability. These are, "impairment" and, ,functional limitation perspectives. The WHO (1976) as cited in EICTDA(2007) defines "disability as any restriction or lack (resulting from impairment) of ability to perform an activity in the manner or with in the range considered normal for human beings".

The "impairment" perspective considers disability as health problem or an abnormality that is situated in an individual's body or mind. It assumes that disability is an intrinsic individual characteristic, i.e., a problem residing solely in the affected individual. Yet, the impairment perspective has been subject to sever critics on at least two counts. Firstly, rather than explaining it in much wider context "It locates disability with in the particular individual" (Lawson, 2005). Secondly, it ignores the role of the social and physical environment in the disabling process(ODI, 2002).

Consequently, this has later given rise to the emergence of the "functional limitations" perspective, which attempts to include non-medical criteria of disability, especially in relation to the social and physical environment. In that way, (ILO) defines disability "as a state in which functional limitations and/or impairment are causative factor of the existing difficulties in performing one or more activities such as self-care, social relation and economic activities."

Nonetheless, the notion that impairment is the direct cause of disability remains central to this perspectives. Further more, the functional limitations perspective considers disability in quantitative terms, measuring functional restrictions against a standard or sets of standards.

The medical model seeks to merely "fix" individuals' physical, sensory or mental disabilities, and tends to favor medical rehabilitation and well fair benefits as charity as viable interventions (ODI, 2002 Mohit 2006, and Mont, 2007). This model of charity and care has also been criticized as "locking PWD's in to cycle of dependency and despondency" (Quinn and Degener 2002), and as unable to ensure their access to mainstream education or employment (Lawson 2005). The model had indeed served as the solo driver of policy and strategy formulation for a good number of government and organizations of the world. Like wise, the medical view of disability has been at the heart of most of policy and programme interventions in Ethiopia for a long time. According to MOLSA (1999), a great deal of the interventions particularly "the services focuses on provision of humanitarian assistance of support for PWDs," and were practically short of mechanisms for "pulling out the PWDs from dependency" on handouts.

2.1.2 Environmental model of disability

The environmental model posits that the individual's environment-both social and physical, can cause, define, or exaggerate disability. It is easy to see the relationship between disability and the physical environment. Disability is viewed as a product of a disabling, un responsive, or insensitive, environment" (Hursh 1995). This model portrays disability as a social construct created by ability-oriented and ability-dominated environments (ODI 2002).

Essentially, environments can limit physical access and opportunities for work, education, and social participation (Tannebaum 1986). If a person with paraplegia does not have a wheel chair, the impact of the paraplegia is greater. According to the social model, even though impairment has an objective reality that is attached to the body and mind, disability has more to do with society's failure to account for the needs of PWDs.

Shakespeare and Watson (1997) concur with observation, and view disability as arising from the interaction of an individual with the physical, cultural and policy environment. Interventions are thus not only at individual level but also at societal level, for example the introduction of universal design, inclusiveness and community awareness (Mont 2007). Adherent of the social model call on policy –makers to remove environmental barriers, to facilitate inclusion and participation of PWDs and to adapt the society rather than the disabled individual (Lawson 2005).

According to the UN Enable website a number of countries in Europe and USA have adopted this view of disabilities and re-orientated their social, economic and political process around PWDs. However, the process has been late or lack awareness in most developing countries including Ethiopia, which has made reference to the social dimension of disability after mid 90's. For example, it is only in 1996 that Ethiopia's Developmental social welfare policy emphasized the social perspective of disability (MOLSA, 1996 P. 73-74). This was also reflected in national programme of Actions, too (MOLSA, 1999). Even if the social model/environmental model of disability gets acceptance in national level in Ethiopia in practice it is not implemented. It is enough evidence to look at the schools that were built in Addis Ababa in 2006-2007. All the schools and building constructed during those years are not accessible to people with physical and vision impairment.

2.1.3 The Human Rights Model of Disability

The human right model emerges from the social model, when peoples start thinking as PWDs should have be valued as equal (ODI 2002) and Lawson 2005). According to Quinn and Degener (2002) "the human rights perspective on disability means viewing peoples with disability as subject and not as an object; and locating the problem out side the individual and addressing them in the manner in which various economic, social, Cultural and political processes accommodate the difference of ability". Although the standard

Rules on the Equalizations (UN, 1993) embraced equal right of PWDs as one of its principles, the process has been slow and uneven among nations of the world (Quinn and Degener 2002). For instance, Ethiopia made official reference to the standard Rule six year later (MOLSA, 1999). However, the united nation has recently taken further step by adopting the UN convention on Rights of PWDs in December 2006, there by elevating the conceptualization of disability into much more wider level. Ethiopia signed the conventions in March 2007. This means "disability is no longer to be considered simply as medical issue or social welfare issue; disability is now considered as a human right issue: and the government has declared its ambition to proceed with formal legislative ratification of the convention and it full implementation". The advocacy group such as organization and associations of PWDs play a great role to bring the issue to the parliament (ECDD 2007). The adoption of the convention indicates that, mainstreaming disability issues in social, economic, cultural and political process had been started. According to the convention, the Federal as well as Regional Government will "be required to identify and eliminate un enabling barriers, to ensure access of Ethiopian people with disability to assistive technology for their information need. Based on the adoption of the convention by FDRE, the present study adopts the right –based view in understanding disability in Ethiopian context. Therefore the findings discussions, conclusions and recommendations of this stud focused on this view of disability.

2.1.4 Functional model of Disability

The functional model of disability theorizes that the functions of the individual influence the definition of disability. Individuals who need physical activity for his daily life would probably be more affected by mobility impairment than those who do not care for such activities. Also, individuals whose work does not require physical, strength, or movement would be less affected by mobility disability.

According to Tirussew (2005), this model is the models most Ethiopians used to define disability. Tirussew (2005) "states that" If impairment does not impose or limit the daily activity of the person, it should not be considered as disability". Most functional models at present include only work activities and activities of daily living (ADL), which assists PWDs in getting to Jobs. Due to this exclusive focus on work and ADLS, many individuals in the disability Right movement regard the functional model of disability as an economic model. According to these advocators, the functional model is primarily concerned with the earning capacity of the PWD. A deaf person who can till the land as equal as a "normal" person is not considered as a person with disability for that activity in rural Ethiopia, he considered as person with disability on the activities that involve hearing.

2.2 Defining Disability in the Ethiopian Context

The work Tirussew(1991) more or less defined disability according to Ethiopian context. Traditionally held views are complicating the proper under standing of disabilities, because disability is traditionally considered as "punishment of God" on disabled person and/or his families, or a curse from elders or forefathers or an attack on evil sprite (UN, 2001, Tirussew, 2005). Tirussew (2005) concurs with the impact of "backward traditional Ethiopians attitude" to wards disability.

In Ethiopia, there is a general tendency to think of persons with disabilities as weak, hopeless, dependent and unable to learn and subject of charity. The misconceptions of causal attribution added to the misunderstandings of the capabilities of persons with disabilities have resulted in a generally negative attitude and stereotyped discernment to wards them (Tirussew 2005). Most families in Ethiopia considers their child's with disability as a source of shame, due to this they limits the social interaction of child with others pear groups. Above all, the quality of interpersonal relationships and scope of participation in socio-cultural activities which entail a degree of acceptance,

love, care and respect as well as range of involvement in main stream socio-cultural activities are very critical for personality development. However, most children in Ethiopia are deprived of such conducive, child-friendly environment in the earliest years of development.

There have been some attempts locally to define disability in Ethiopian context as the handful of working guides and legal instrument suggest. For instance in his previous work (Tirussew, 1991) defines "a disabled person as any person unable to ensure by himself or herself a normal life, as a result of deficiency in his or her physical or mental capabilities". Similarly another legal instrument issued by the Imperial Government as cited by Tirussew defined "the disabled as peoples who because of limitations of normal physical or mental health, are unable to earn their livelihood and do not have any one to support them" (Negarit Gazeta,Imperial Government of Ethiopia 70/1970).

2.3 Visual Impairments

Visual impairments include total blindness from birth; the gradual loss of vision; muscular disorders, such as strabismus or "crossed eyes"; and loss of acuity across the visual field, such as tunnel/vision (Falvo 1991; Rosenthal and Cole 1993). People who wear eye glasses are not considered to have a visual impairment simply because the use of a common and easily obtainable device such as eye glasses restores the individual to full functioning. Indeed, in order to be considered a visual impairment the condition must be severe enough to limit daily functioning of an individual. Visual impairment may also be caused by genetic factors such as malformations or may be acquired due to infections, inflammations, accidents or tumors. However, a large percentage of visual impairment have unknown causes caplantel (1991). The percentage of individuals with visual impairment increased than ever before because of the larger percentage of elderly people (Silver Stone, Lang, Rosenthat & Faye 1999). Visual impairment highly correlated with age and as

the population ages, the number of people with visual impairment increases. Advances in medicine and medical technology have greatly decreased the number of new born infant born with blindness, and yet have also indirectly increased the number of elderly individuals who are blind. Due to the fact that medical advances have lengthened the life span of elderly individuals, they survive with disabilities many of which are visual impairment.

The visually impaired are broadly classified into two groups based on the degree of visual impairment. This includes the partially (weak) sighted or persons with low visions and blind.

Visual impairment can be defined from medical (clinical), legal or educational perspectives. In this paper, which deals with rights and potential capability of persons with visual impairment, it is defined from the educational perspectives only. It could be merely defined as any eye defect which hampers the educational performance of a child and entails some adaptation and use of assistive technology in educational areas.

In terms of it severity, visually handicapped individuals are categorized into, partially sighted (low vision) and blind. According to (Ysseldyke and Algozin 1995) the two terms are defined as

1. Partially sighted learners are those having significant problem but still use their residual sight for education purpose. Such student use print materials but may need modifications such as enlarge print or use of law vision aids (magnification)
2. Blind learners are those whose visual impairment is so severe that they must relay on senses other than vision to function adequately. Such students are educated through Channels other than sight (for example using Braille or audio-tapes).

It is important to acknowledge that visual impairment is a range of ability, not a homogenous group. This affects how services should be provided to

them. As cited in EICTDA (2007) (Westling,2004) states, "What suit a person with some vision may be of no use at all to some one who is totally blind"

2.4 Assistive Technology

Assistive technology is technology used by individuals with disabilities in order to perform functions that might otherwise be difficult or impossible. Assistive technology can include mobility devices such as walkers and wheelchairs, as well as hardware; soft ware and peripherals that assist people with disabilities in accessing computers or other information technologies. For example people with limited hand function may use a keyboard with large keys or a special mouse to operate a computer, people who are blind may use software that reads text on the screen in a computer-generated voice, people with low vision may use software that enlarges screen content, people who are deaf may use a TTY (text telephone), or people with speech impairments may use a device that speaks out loud as they enter text through a key board.

According to (King's fund consultation 2001): Assistive technology is defined as "any product or service designed to enable independence for disabled and older people". In March, 2001a kings fund consultation meeting agreed a definition for 'Assistive Technology' (AT) to replace the term disability equipment in the UK. This definition is increasingly used because it more accurately reflects the wide range of equipment and services that assists older and disabled people to maximize their independence. It also acknowledges the cross over between inclusively designed, mainstream products and technology specifically made available to assist disabled and older people. Learning from united states was that to define the term too closely using illustrative lists of equipment ran the risk that any associated legislation, funding or regulatory measures failed to cover emerging technologies not included in the listing. Using a broad definition, focused on a persons-centered out come of maximizing independence, enables the sharing of a

common evidence base. Consensus on good practice can then be related to practice with in particular areas of assistive technology.

Assistive Technology (AT) is still used to denote a particular range of equipment by different sectors, for example, people working in Education tend to define AT as product and service which assist learning; computers; communication aids and digital learning aids. As integration across services to disabled and older people increasingly takes place between health, social care, education, housing and employment services such variation in the use of the term will resolve itself.

Assistive or adaptive technologies are terms used to describe devices that compensate for functional limitations such as mobility communication environmental control, and can enhance and increase learning and independence. Such devices have enabled many individuals to literally communicate, enjoy recreation and social context and live more normal lives. An assistive technology device can be simple or complex, high technology or low technology.

2.4.1 Current Assistive Technologies for information provision of PWVI

It is only possible for visually impaired people to gain access to information provided through the WWW because of the availability of technologies that enlarge text or convert the information to audile or tactile media.

The brief out line of the technologies most frequently used, either for computer or other electronic access, or for computer use in conjunction with the Internet.

- Magnification programs for the computer screen allow people with some vision to view text or images which have been magnified several times and are capable of integrating hardware and software.

- Synthetic speech systems comprise a synthesizer, which does the speaking and the screen reader which tells the synthesizer what to say (American federation for the blind, 2000 n.p)
- Screen reader is the commonly used names for voice output technology. Hardware and software produce synthesized voice out put for text display on the computer screen, as well as for keystrokes entered on the keyboard. (Adaptive Technology Resource Center, 2000 n.p). Screen reader can be used for all kinds of computer-assisted process, including use of the Internet.
- Optical character recognition (OCR) technology consists of three possible processes: Scanning, recognition, and reading text. A printed document scanned by a camera OCR software then converts the images into recognized characters and words. The synthesizer in the OCR system then speaks the recognized text. Finally the information is stored in an electronic form, either in personal computer or in the memory of the OCR system itself (American Foundation for the blind, 2000 n.p).
- Braille printers are available for those who can read Braille. These produce a hard copy and can do so from various computer devices. Other Braille display technology allows what is displayed on the computer screen to be transposed into Braille.

  These devices operate by rising and lowering different combinations of pins electronically to produce what appears on a portion of the computer screen. They are refreshable, that is they change continuously as the user moves around on the screen (American foundation for the blind 2000 n.p).
- Note takers are small electronic devices similar to electronic daily organizers available to any one, with the exception that they have speech out put and an optional Braille Keyboard. (American foundation for the blind 2000 n.p).

- A hap tic interface is a device, which allows a user to interact with a computer by receiving tactile, feed back. It is a force-reflecting device, which allows a user to touch, feels manipulate, create and/or alter simulated three-dimensional objects in a virtual environment (office of training technology 2000).

  Hap tics were first developed so that users could feel objects in virtual environments. It is still a relatively new technology and may broaden the interaction between computer-stored information and blind or visual impaired people when the technology and training required become more freely available (Brewster 2001 n.p).

2.4.2 How people with visual impairment read: Assistive technologies

Computer and assistive technologies have caused a significant change for the people with visual impairment in access to information. Assistive technologies involve a Braille display that the PWVI use instead of screen a speech synthesizer (external hardware unit) or a screen reader (software) that read aloud text appearing on the screen.

Differences between the Braille display and screen reader are in alphabet that are used (Braille & Common). Also one needs to bear in mind that the Braille display accesses only one line of the text at a time, and does not caption the whole page on the screen. This largely influences the serial information seeking behavior of the blind users.

Braille embossers are another piece of hard ware that enables the blind to have material printed in Braille.

An ideal solution seems to be software that does optical character processing of text on the paper put on the scanner and that immediately synthesizes speech; i.e. automatically reads a printed page. For the visually impaired these is also screen magnification software.

There are three main work stations adjusted PWVI

- Completely closed system: one integrated hardware unit comprising of all necessary component (scanner, keyboard, computer)
- A semi-open system: PC components that are not integrated into one a hardware unit, but are separated; and
- An open system: a typical PC with software for the blind (internet support for blind internet users.

2.5 Accessibility

Accessibility has been the overriding concern in the disability rights debate through out the world (Mohit 2005). According to UNESCAP the term accessibility is defined as "the measure or condition of things and services that can be readily be reached or used (at, physical, visual, auditory, and or cognitive level) by people including those with disabilities. This definition is however, as broad and pervasive as it can be possibly connote different meanings when applied in diverse circumstances. Yet, the concept of accessibility as specifically related to disability is set out more conspicuously in the world programme of action (WAP) concerning disabled persons (UN, 1982). In particular, WAP's 3rd goal of "equalization of opportunities" of PWDs, which later became standard rules (UN 1993), sets accessibility in the context of disability. The standard rule clearly links accessibility to human rights perspectives of disability out lined above. In particular rule 5 recognizes accessibility as important for equalization of opportunities for PWDs in the full exercise of their civil and political, social, economic and cultural right, at large, and their access to the physical environment as well as information and communication, in particular. In much same vein Ethiopia refers to accessibility as "the provision of barrier free facilities to PWDs in accessing information and communication services and their mobility from place to place so that they can successfully run their life and practice equal participation in all sectors (MOLSA 1999).

However, due to absence of legislative enforcements, practical efforts have been either limited or non-existent in many parts of the world, including Ethiopia. As waddell (2003) observes the standard rule have mainly "served as an instrument for policy making as well as a basis for technical and economic cooperation" among most nations. Cognizant of this members of the global the standard rule as "legally not binding" and have instead called for international convention which not only recognizes "accessibility as an essential component of a broad-right-based approach to development". (World Enable, 2003) but also provides legal protection.

Recently, the UN (2006) has made the concept of accessibility in the context of the PWDS as an explicit human rights issue as it is legally binding. Article 9 of the convention elaborates accessibility as the right of entry of "PWDs, on equal bases with others, to the physical environment, to transportation, to information and communication, including assistive technology and system (UN 2006).

2.5.1 Assistive technology accessibility and disability

Drawing on the foregoing discussion, what does accessibility of assistive technology mean in context of disability? According to Abrehams (2006) accessibility can be defined more precisely as that all the content and function of an ICT system should be accessible to people with disability. Similarly Waddele (2003) define accessibility as "the accessible design of product, services or systems where the user interface is flexible enough to accommodate the widest range of user needs and abilities. Bush (2006)as cited in EICTDA(2007), emphasizes the context of the disabled in defining accessibility as "the ability of disabled people to make use of information and communication technology using adapted hardware and software.

Evidently, these perspectives emphasize the significance of flexible design solution to enhance the functionality and content of ICT product or services and to make them more relevant to PWDs. This is indeed an essential aspect

of accessibility, because "barriers occur when the design of the technology fails to allow all the variation in user's abilities (Irish National Disability Authority 2002). As Mohit (2005) notes, most ICT product or services "presuppose the users ability to see, hear, and use hands as a result of which person with physical sensory and cognitive impairments could not access due to inflexible design". While this is undoubtedly a key issue, that "How" is another critical aspect of ICT accessibility. The question then goes: how is accessible ICT for PWDs made possible? The literature identifies two approaches to accessibility of ICT for PWDs. The first is the design for all or universal Design Approach, which is defined as a set of properties that must be build into ICT product, services, or systems from the outset enabling people with in the widest range of abilities and circumstances as is commercially practical to access and use Nordic cooperation on approach as Shnelderman (2000) refers to this approach as universal usability which is the design of information and communication product and services, that are usable by every one regardless of their circumstances. However, it is also argued that "design-for-all" can never satisfy the needs for all people, as there will always be some people who need some kind of assistive devices, which are specifically design add-on devices that compensate for different kinds of disabilities (Nordic cooperation on Disability, 1999). This is the reasonable accommodation approach to accessibility, and is broadly defined as the making of necessary and appropriate, modification and adjustment to ensure PWDs the enjoyment or exercise on an equal basis with others of all human right and fundamental freedoms (UN, 2006). In the context of ICT, accessible ICT with reasonable accommodation recognizers the flexibility of technologies to provide appropriate functionality necessary for meeting users need and preferences (World Enable, 2003).

2.5.2 Accessible Design

The ability of a person with disability and his or her preference should be taken into account in designing ICT products and services. Accessibility issues are not identical as the heterogeneity of disability indicates.

2.5.3 Accessible design for visually impaired

Technological design solution for accessibility of person with visual impairment cannot be identical due to variation in the severity of the impairment. For instance, for totally blind people screen reader (Jaws), that turns text into speech, or retractable of refreshable Braille display to read the text on the site may be the ideal solutions. On the other hand, people with limited vision such as funnel vision or cloud vision, a set of other ICT solutions such as screen magnifiers and extra large screen can enhance accessibility.

Alternatively, audiotapes or Braille printout may be used for access to information in the public domain. Audiotapes and Braille printout ensure access for the blind to print information in alternate forms. Further more, talking books can be used to access information available in mainstream publishers, government and libraries. Today, the traditional talking books which is an analogue representation of a print publication is converted into a digital taking book (DTB) which makes multi-media presentation of a print publication (Diasy Consortium 2005).

2.6. Computer literacy

Computer literacy means knowing some basics of ICT to, for example, save and open a file, use a word processing program, and send and receive e-mail for starters. Moreover it means having some sort of level of comfort around computers rather than a having some fear or a feeling of foreboding(New York times company 2006). Idowu (2004), as cited on mutual indicates that knowledge, skills, and confidence with computer technology are now an asset

for those entering the competitive employment market. They point out that every aspect of life from education, leisure and work environment to social interactions is being influenced by computer technology. Moreover, with the increasing use of ICT in education the world over, new skill sand competencies among students are required for them to effectively learn. For example, there are vast array of services that one can currently find online. These services are constantly growing, some which are of general nature while others are specialized for students such as reference information on the Web that students can find of use that includes different information.

Tomas Rivera Policy Institute (2002) in United States noted that students who did not have access to computers and the internet (among other technologies) were likely to get further behind their peers who did have such access. Such deprived students would miss the instant links to information, entertainment, and communication. In addition, they would potentially miss out on the 70 percent of jobs that require moderate or high amount of computer knowledge, all of which pay well and probably would end up in 10 percent of low-paying jobs that do not require technical expertise (Linn1999). With the increased use of ICT in society in general and schools in particular, it becomes imperative that students should be equipped with digital literacy competencies in order to exploit information resources that the electronics age engenders. The importance of computer literacy especially in higher education does not need to be over emphasized. New York Times Company (2006) points out that most business, a computer is a standard tool. With in higher education, computer literacy is being recognized as an important component of the curriculum.

2.6.1. Concept of computer literacy.

Definitions of computer literacy abound in literature. Idowu (2004) as cited in mutual (2008) define computer literacy as the ability to make use of computer system to word process documents, analysis data, develop small computer program's, browse internet install software. The department of education in

the united states of America (1996) observes that information literate individuals in addition to knowing how to use the computer for word processing, spreadsheet and internet access makew use of increased learning opportunities provided by such technology.

2.6.2. Gender and computer literacy

Evans (1994) as cited on mutual (2008) observes that gender is a fundamental category for ordering and classifying social relations in the world. Research has over the years shown that males dominate in the use of computer compared to women (Geissler and Horidge, 1993). Similarly, even in situations where male and female are given equal access, men are more likely to be main computer user than women(Becker and Sterling ,!987 , Idowu, 2004). Traditionally, girls tend to be interested in computers, use them less often in their spare time and have more negative attitude towards computers. The research indicates that male students are students are very interested in how technology works while female students tends to focus on how the technology is used (Silver,2001). Furthermore, studies that have examined the relationship between gender and computer attitude have reported that males tends to have more positive attitude towards computer. On the other study found that males had a higher level of computer literacy than females.

2.7. Support services to PWVI

Usually impaired students whether they at elementary, secondary or tertiary level they may require a great amount of additional support services so as to benefit adequately from the regular operation of that programme. In this paper, however, only guidance and counseling services and library services are considered.

2.7.1.Guidance and Counseling Service

The institute or higher education which has a highly developed guidance programme will find its exceptional students assisted in many aspects through out the regular operation of that program. The program should help an individual to understand himself/herself and his/her environment to the point that he/she will be able to develop goals and aspirations in keeping with his/her potentialities.

This is especially true for handicapped person since his/her versatility is usually limited by handicap. An accurate understanding of his/her potentialities assumes more important to the handicapped than it might do to the non handicapped person with a wider chance of choice (Finch and Yowell 1950).

The guidance and counseling services provided have to enable the handicapped, including the blind to accept the limitations that can not be avoided and to develop attainable and satisfying goals with existing limitations. For example, the blind person must be able to see himself as blind but not perceive blindness as a limiting factor on his possibilities to be a whole person. The handicapped person could be as well adjusted as any one else even when the individual faces extraordinary difficulties. What must be special here is that the counselor of the handicapped has to possess a higher order of professional competence by applying his/her scholastic knowledge he/she needs to make a lot of efforts to modify various environmental conditions, which affect the adjustment of the handicapped (Jordan and Hunter 1965, Finch and Yowell, 1950). The competent counselor who is capable of understanding the needs and difficulties of the blind person and who is effective in helping the person to under stand himself/herself and set his/her own goals must have a deep understanding of the institute and the ways in which it can offer optimum possible services to the individual. The counselor ought to assist the institute develop varied and flexible

programs to provide educational services which meet the special needs of the individual with handicaps, including the blind (Finch and Yowell 1950).

According to Jordan and Hunter (1965) a blind person projects various reasons for the refusal of accepting his/her blindness. However it is highly crucial that the counselor has to make his/her ultimate effort to rehabilitate the individual to the change in self before he/she accomplishes all the new learning's, helpful for his/her future development. The counseling process is significantly essential to assist the blind person in reorienting his/her self-concept.

2.7.2. Library Services

Socially conscious librarians seek to serve all the public including the handicapped and they view the library as one of several institutes working with in society aimed at improving social conditions and developing human resources (Martin 1975). This service is highly prevalent in institutes where a range of citizens having various aims interests and tastes of reading are educated. The classroom textbook cannot achieve these variety of individual needs librarians, thus are the right persons to provide their customers with proper materials available. Digital libraries on the WWW are of particular importance in this context, both if they contain full-text documents or secondary information resources. The existing digital libraries and collections would be crucial to the people with visual impairment for their information needs. Hence making the digital library service accessible to the visually impaired student is one of the expectations of the library.

For the first time in history the people with visual impairment (PWVI) can read from original source of information, those available on WWW, at the same time as any body else. This is an enable through assistive technologies such as text-to-speech soft ware or Braille display that support speech or Braille out put. As usual when using digital information resources no volunteers and friends needed to read individual access to original sources of

information is particularly important to people who cost sight in their later life, as they really learn how to use Braille (William Son, Schauder, Bow 2000). Undoubted the person can draw that institute libraries having visually impaired clientele ought to service; Braille books special tape cassettes, talking book in their collection. Diverse forms of larger print materials, which serve blind print reader much, be available too. In short institute libraries are responsible to accommodate the reading needs of its all type of student including the blind. The digital library must be supplied by all kind of assistive technologies that are available to enhance the equal participation of blind and visually impaired students.

2.8. How can blind and vision-impaired people use a computer? Evidence from Blind people:

Several companies today market computer program that allows a blind persons to use a standard computer. These computer programs are called "Screen readers". A screen reader is itself a standard window computer application, but its job is to run along side the other programs running on a computer and "tell" the blind person what is on the screen. Because a blind person cannot see what is on the screen, a screen reader typically has a built-in speech synthesizer, which, although perhaps sounding a bit like a robot, speaks information to the user through the normal sound speakers of the computer itself.

People with some limited sight typically use a different kind of screen reader which magnifies and enhance the image on the screen to make it easier to see, and some people use both speech and magnification at the same time. But whether a person uses speech or magnification, typically the screen reader is just a computer application that comes on a CD and easily installs on most computers. The screen reader keeps track of what the computer is doing and speaks or magnifies the necessary information that a user needs in order to use the computer. A sighted persons look at the computer screen of course he/she see the whole screen but instinctively he/she focus his/her

attention on the bit of the screen that is immediate relevant. A screen reader does the same things. It does not simply read the whole screen, because that would quickly become tedious. But is monitors the screen and automatically tells, the blind user the most important information about what is currently happening. A totally blind person, some one with no sight at all to read the screen, cannot use a mouse most functions can be operated from the keyboard, through this does vary with different programs, and a totally blind person learns how to access the needed functions by using the keyboard.

CHAPTER THREE

3.1 Methodology

3.1.1 Research Design

This is a non-experimental study and the basic methodology chosen for this study is a mixed method research. The mixed method research involves both qualitative and quantitative approach. Therefore, this research will adapt methodologically pluralism by combining both deductive and inductive approach. The rationale of using a mixed method study, is that all methods have limitation, the biases inherent in any single method be neutralized or cancels the biases of the other method. On this study, the strategies of inquire involve collection of both qualitative and quantitative data's sequentially. Data collection also involves gathering both numeric information (e.g. on instrument) and text information (e.g. on interview). Therefore, that, the final database represents both qualitative and quantitative information. To capture this quantitative data questionnaires will prepare and administered to the student with visual impairment at Addis Ababa University. To generate additional qualitative data through semi-structured interview will be prepared. Finally, one or more case study will be included on the study to indicate the potential of blind Internet users. For this purpose in depth interview will made with the student at Addis Ababa University

3.1.2. Research site

This study will conduct at Addis Ababa University. The samples of the study are the students with visual impairment who pursue their education in different department in the University. Addis Ababa University was the first University founded in Ethiopia by Emperor Haile silassie, and it is located in the northern part of the metropolitan. The university provides first degree, second degree and third degree in different disciplines for Ethiopians from different parts of the country including students with disabilities. The university has a good experience in providing educational service to people with visual impairment. As a result, many Ethiopians with visual impairment

had graduated from this University. Before three years ago, the University opened a new department, the department of special needs education under the faculty of education. This department provides services to the student with disabilities. The university opened digital libraries that are accessible to all university students including student with visual impairment, however visually impaired students do not have access to Internet services, as it needs them the use of assistive hardware and software technology.

3.1.3. The population of the study

The populations for this study were students with visual impairment who pursue their education at Addis Ababa University. The population of the study was drawn from 171 visually impaired students at AAU. AS the information obtained from resource room under the special needs department indicates there were 171 visually impaired students at AAU currently. The population of the study consists of visually impaired students from both sexes, male and female. Addis Ababa University opened a digital library at different places in the campus. Most of the students of the university have access to the Internet service for their information needs including visually impaired individuals. The digital library is available in the resource room provides a library service to student with disabilities. However, student with visual impairment don't have access to computer and Internet services and/or have a limited access to the services when compared to other student with disability or without disability, as the impairment needs them to use assistive hardware and software technologies. Therefore to assess the problem with accessibility of assistive hardware and software technology by student with visual impairment at Addis Ababa University the samples of the study is drawn from visually impaired student that follow their education in the university currently. In addition to this the following segment of population of Addis Ababa University are considered as a source of the sample of the study.

- The department of special needs education

- The office of student dean
- The department in which the visually impaired student found.

3.1.4 Sample of the study

The sample of the study consists 98 visually impaired students who currently pursue their education indifferent department in AAU. 98, participants' consistitutes 57.3% of the total population in the university. 56 male and 42 female students with visual impairment from different department were participating on the study. The sample consists visually impaired students from second year –to post graduate students with age rang from 18 yeas of age to 30 years of age.

3.1.5. Source of data

The data for the study on accessibility of hardware and software assistive technology to SWVI at Addis Ababa University will collect from three different sources:

1- From visually impaired student at Addis Ababa university
2- From librarians who work in digital library or main library in AAU.
3- From NGOs that provides adaptive technology training to PWVI in Addis Ababa

3.1.6. Data collection instrument

Two types of instrument, namely questionnaires, interview guide will used to collect data's for the study. The researcher based on the review literature will produce this instrument and some of the instruments are adapted from the research conducted before. The rationale of using the selected above two data collecting instrument is, that they suitable to collect adequate information for the study intended and convenient for data analysis. The above two instruments are popular means of collecting all kind of data in research. These instruments are widely used for the research conducted in educational area to obtain information on certain conditions and practices, to inquire into opinion and attitudes of an individuals or a group, and that is why the

researcher selected these instrument. For the purpose, a semi- structured interview guide and open-ended and closed- ended questionnaires will be prepared and employed. Through the above instrument of data, collecting the following information will gathered for the study.

- The abilities of SWVI, to use assistive hardware and software technology for their information need.
- The problems countered by SWVI while using assistive hardware and software technology.
- The barriers that limit visually impaired student to use assistive technology
- The support and guidance service exist to SWVI to use the technology.

3.1.6.1. Interview guide

The interview guide is prepared based on the research questions of the study. The interview guide contains the questions related to:-

- The profile of the respondent
- Accessibility of assistive technology to visually impaired student.
- Barriers that limit visually impaired student to use assistive technology.
- The training required to use assistive hardware and software technology
- The awareness of the visually impaired student to use assistive hardware and software technology

The advantage of conducting semi-structured interview is that, it allows for the discussion of complex and unstructured issues that are hard to discover by other method. The interview guide was unstructured one and provided flexibility during interview process. This interview guide used with six sampled students (three students who have access to computer and Internet and three students who does note have access to computer and Internet). The interview also used with two sampled librarians that work at digital library in

the university. In addition to this an interview will be prepared to the NGO centers and conducted with two experts that provide adaptive technology training to people with visual impairment. All interview conducted will be recorded by tape-recorder with necessary field notes

3.1.6.2. Questionnaires

Under this questions that are based on research problems of the study and the review literature will prepared and administered personally to the student that assist in reading questions to the student with visual impairment. The questionnaires used for twenty percent of the student with visual impairment at Addis Ababa University. The questionnaire consisted both close and open-ended forms of questions, the questions has the following heading

-Question related to accessibility of assistive hardware and software technology

- Questions related to access to training service
- Questions related to guidance and support to VIS at Addis Ababa Addis Ababa University.

-Questions related to barriers that limit SWVI to use computer and internet

3.1.6.4. Data collection procedure

Before data collection began, a letter of cooperation will be received from the department of special needs education (Addis Ababa university) and submitted to the bodies that though as a source of the sample of the study. The data for this study is collected using the instrument mentioned above, but before that, the researcher makes an observation to the digital libraries in Addis Ababa university main campus including the resource room that gives computer and Internet service to student with disabilities including visually impaired student. Before administering that instrument, the participants are informed about the purpose of the research and objective of the instrument. The interview guide is conducted with sampled sex student with three students who have the capacity to use computer and Internet by them selves,

and three of the student who do not use computer and Internet for educational services. Further more an interview guide is also conducted with two librarians and two heads of AT training center to people with visual impairment. The interview recorded by the tape recorder and important point rise by the participant concerning accessibility of assistive technology is listed down on notebooks.

3.1.6.5. Data analysis

For this particular study, the data has collected by two different methods. Quantitative data has collected through the administration of questionnaires to selected sampled, visually impaired student at Addis Ababa University. The qualitative data that has gathered through an interview guide contains open-ended and semi-structured questions. The qualitative data is collected from three sources, from the selected sampled visually impaired student at AAU, from the librarians that work in digital library of AAU and from the heads of NGO centers that provide adaptive technology training to people with visual impairment people. Preparing a plan of analysis of data before the actual work of analysis is advisable. Therefore, the qualitative data collected using the above instruments tabulated, organized, analyzed and interpreted for drawing sound conclusion. The organization of quantitative data includes editing classifying and tabulating the information. The analysis of quantitative data means studying the organized material in order to discover inherent facts. The quantitative data is analyzed using the procedure set for analyzing quantitative data's.

The qualitative data, such that the verbal data gathered through interview with field notes collected through observation is carefully organized and analyzed. This data indicate what people have said about accessibility of assistive technology for the information need of people with visual impairment by their own words about their experience and evidence on library users of people with visual impairment. The data's collected qualitatively and observation, needs a good knowledge of editing, organizing and classifying

into specific patterns, categories and descriptive units to avoid complication. And the organization qualitative data involves a lot of cutting and pasting; therefore a necessary working plan for the analyses of the data is prepared. For the purpose of data analysis, a sequential procedure employed. The researcher intended to elaborate on or expand the finding of one method with another method. Therefore, the qualitative data through interview will be analyzed and interpreted first. The finding result of this data used as an exploratory for the quantitative data obtained through questionnaires. This method of data analysis comes up with reliable results as the quantitative data samples a large population.

3.2. Operational definition of the terms

1. **Visual impairment**: - it is the sight problem of persons that is characterized by low vision or blind.
2. **Assistive technology**: - is a hardware and software technology that assists people with visual impairment to access information from the internet service.
3. **Information**:-it is the information that is obtained through the internet service
4. **Accessibility**:- according to this paper accessibility means availability and provision of barrier free service to the people with visual impairment
5. **Assistive hardware technology:-** Is the hardware like Braille embosser, refreshable Braille display, CCTV(closed circuit Television),that assist person with visual impairment to use computer and Internet.
6. **Assistive software technology:**-is software used by people with poor sight or blind to get access to the printed materials to their information need.
7. **Sceern reader (jaws)**: - a software that reads text on the screen to visually impaired person

CHAPTER FOUR

4.1 Findings and data analysis

The data requirement of the study was met by means of structured questionnaires administered to student with visual impairment (SWVIs) at Addis Ababa University and semi structured interview conducted with local NGO training centers on Adaptive technology to PWVIS, the librarians that work in digital library of Addis Ababa University and Visually impaired students themselves.

From the total of, (171) population of the student with visual impairment at AAU, 57.3% participate on the study.

From the sample of 104 student with visual impairment valid response is obtained from 98, i.e., response rate is 94.23% which high enough

The respondents were asked about their sex, age educational level, economic background of their families and the monthly pocket money they receive from their parents. The study therefore begins by treating these characteristics. Table 4.1.1 below shows classification of respondent by Gender.

Table 4.1.1: Respondents Categorized by Gender

Gender	Frequency	Percentage
Male	56	57.14%
Female	42	42.86%
Total	98	100%

As can be seen from the table 57.14% of the respondents were males while the remaining 42.86% were females. The participants of the study were also categorized by educational level. The participants were all the university student pursing their studies in different department most of them are from, law, history and language department. They were those, student who were study for their first degree and first degree holders

Table 4.1.2: Respondent Categorized by Educational level

Year	M	F	T	percentage
2nd	9 (16.07%)	13 (30.95%)	22	22.44%
3rd	17 (30.35%)	17 (40.47%)	34	34.69%
4th	23 (41.07%)	12 (28.57%)	35	35.71%
5th	5 (8.92%)	0 (0.0%)	5	5.10%
MA	2 (3.57%)	0 (0.0%)	2	2.04%
Total	56 (100%)	42 (100%)	98	100%

As can be seen from the table 4.1.2. 22, (22.44%) of the respondents were second year, 34 (34.69%) were from third year, 35, (35.71%) were from 4th year 5 (5.10%) were from fifth year and 2 (2.04%) were past graduate student. This shows an attempt was made to take senior VIS at Addis Ababa University who have a lot of work to use computers and internets.

An attempt was also made to categorize respondents by age. The age range of the respondent was from 18-30 years of age

Table 4.1.3: Respondent Categorized by Age

Age	M	F	T	Percentage
18-19	3 (3.35%)	6(14.28%)	9	9.18%
20-21	9 (16.07%)	8(19.04%)	17	17.34%
22-23	19 (33.92%)	20(47.61%)	39	39.79%
24-25	17 (30.35%)	8(19.04%)	25	25.51%
26-30	8 (14.28%)	-(0.0%)	8	8.16%
Total	56 (100%)	42(100%)	98	100%

4.2 Access to assistive technology

Addis Ababa University has opened the digital libraries at different faculties and departments. The digital library is accessible to all the student including student with disabilities, visually impaired students are one of those. But according to the context of people with visual impairment accessibility of assistive technology does note mean availability of the devices but rather the use of the technology without any barrier. The ratio of visually impaired

student to the computers loaded with jaws (Screen) reader is not less than, the ratio of normal vision student to the computers in digital libraries. But the problem lies with the usage of the computer and internet with the help of adaptive technologies. Accessibility of adaptive technology to PWVI doesn't mean availability of the material but the usage of that technology by PWVI with out any barriers. The respondents were asked their capacity to use computer and internet for their educational purpose.

63(64.28%) of the respondents said that they have not used computer and internet for their information needs, while 35(35.71%) of the respondents have used to computer and internet for their information needs. Table 4.2.1 below indicates this in detail.

Table 4.2.1: The ability to use computer and internet

Can you use computer and Internet for information needs?	sex			Chi - square
	M	F	Total	
Yes	26(46.42%)	9(21.42%)	35(36%)	$X^2 = 6.533$ df = 1 P = 0.011
No	30(53.57%)	33(78.57%)	63(64%)	
Total	56(100%)	42(100%)	98(100)	

As can be seen from the table the majority of the student 64% cannot use computers and internet for their educational purposes. Regarding computer usage ability there is a difference between male and female students. Male students are found more computer users than female students x2=6.53,df=1,p=0.01. According to the study, 74.28%computer users were male students. Once an appropriate number of the student with visual impairment who use computer and internet are determined it was also necessary to determine how they make use of them.

Therefore 22 (62.85%) of those who used computer and internet confirmed that they used them by themselves unassisted by others, while 5 (14.28%) used them by assistance of either librarians or another friend with normal

vision. The remaining 8 (22.85%) make use of computer and internet both by themselves and with assistance of another person. The majority of the visually impaired student, who was able to use computer and internet, use it by themselves unassisted because of the suitability for the usage of the assistive technology.

In order to determine the accessibility of the computer and internet to visually impaired students a question was asked to those who used the computer and internet without any assistance what so ever. 19(86.36%) of them, said that the computer with screen reader has been set up to suit their needs.

While 3 (13.63%) responded that they have the basics and know how to learn in their own. the table 4.1.5 below shows this.

Table 4.2.2: Why do you use computer unassisted?

Description		M	F	T	percentage
1	It had been set to suit my needs	11(81.61%)	8(88.8%)	19	86.36
2	I have basis and know how to learn	2(15.38%)	1(11.1%)	3	13.63
	Total	13(100%)	9(100%)	22	100

In order to determine which assistive device and/or assistive soft ware were helpful in making use of computer, unassisted the question make raised to the respondent.

30 (85.71%) of the respondent were able to identify the assistive software that helped them to use computer 30 (85.71%) of the respondent said that a computer loaded by screen reader software enable them to use computers and the respondent was unable to choose the other assistive software and/or assistive hardware, like screen magnification, Braille embossers computer filled with CD-ROMs, because the digital library of Addis Ababa University do

not provide service that include assistive hardware technologies. 5(14.28%)of the computer users was unable to answer the question raised.

The interview conducted with librarians at Kennedy library confirms the above idea

> *"The library does not provide service to visually impaired student on Braille embossers. We use Braille embosser to translate print materials to Braille materials in the library; even now the embosser is not under operational because of lack of skilled man to operate it. But we train student with visual impairment at the training center to use computer with screen reader (Jaws) respondent from the library."*

The respondents were also asked whether they use assistive hard ware devices in the library. The assistive, hardware like, Braille embosser, larger print printer, Refreshable Brail display are note in service area. The entire respondent said that they use none of them. Hundred percent of the respondents do not use such assistive hardware in digital libraries of Addis Ababa university.

If they give such valid response it was necessary to ask questions why they do not use them. All of them gave various reasons for not using the above assistive hard ware and software technology. The reasons they provide as assurance were.

- *Such materials are not available*
- *I do not take training on such device*
- *The library do not make access of such device*
- *I don't allowed to use Braille embosser*
- *Such device all not available in the library etc.*

Those who used computer and internet were also asked whether they use different assistive software in the libraries or not? But all of them answered that they use screen reader (Jaws) only in the libraries. According to the observation of the researcher, the student in with visual impairment at AAU

do not know what available in the library for them. The details it given in the table below.

Table 4.2.3: Which of the following assistive software do you use in the library

description		M	F	T	Percentage
1	Screen reader (Jaws)	26(100%)	9(100%)	35	100%
	Total	26(100%)	9(100%)	35	100%

After a valid response is obtained from the blind library users, used only screen reader (Jaws) for their information purpose, It was necessary to ask them for what purpose they use "Jaws". All the respondent said that the benefit they get from using of the screen reader (Jaw) were operating computer, surf the internet /web, and access to books and printed materials. The summary of interview from the librarian was as follows.

"The visually impaired students use only the screen reader they used it for any information they need and internet service."

The detail is given in the table below.

Table: - 4.2.4. Which of the following benefits have you got by using screen reader?

description		M	F	T	Percentage
a	Operate computer	26(100%)	9(100%)	35	100%
b	Surf the internet/web	26(100%)	9(100%)	35	100%
c	Access books and printed materials	26(100%)	9(100%)	35	100%
	Total	26(100%)	9(100%)	35	100%

Of those who have able to use screen reader and got the above mentioned benefit, the next question raised to the respondent was where they get, the computer and internet service. Out of the total respondent 33 (94.28%) of the respondents said they get such service from Addis Ababa University digital library while 2 (5.71%) said that they get service from both NGO founded centers in Addis Ababa and Addis Ababa University. As can be seen from the

response of respondent on table below, the chance of getting computer and internet service with screen reader (Jaws) by usually impaired is limited out side AAU. The respondents do not mention the other place except A.A.U and NGO center where screen reader is found. See the table below.

Table4.2.5 Where did you often get computer and internet service

description		M	F	T	Percentage
1	Only AAU digital library	24(92.3%)	9(100%)	33	94%
2	AAU lib. and NGO founded centre in AA	2(7.92%)	0(0.0%)	2	6%
	Total	26(100%)	9(100%)	35	100%

For those who get computer and internet service the next question mentioned was for what purpose they use web search, almost all respondent said that they used web search for educational and work related information , for news and current information. And few respondents in addition to this said that they use it for E-mail communication.

4.3 Access to computer training

Respondents were asked whether they were trained on the usage of computer and internet. As can be seen in table4.3.1 below, only 40(40.81%) of them has taken a training on the usage computer and internet where as 58 (59.18%) did not take training on computer and internet see the table below.

Table 4.3.1 "Have for been trained to use computer and internet?

Response	M	F	T	Percentage
Yes	29(51.78%)	11(26.19%)	40	40.81%
No	27(48.21%)	31(73.8%)	58	59.18%
Total	56(100%0	42(100%0	98	100%

For those respondents who take training on computer and internet it was necessary to raise the question where they took the training According to the response obtained from respondent who take training on computer and internet 34(85%) take the training on computer in Addis Ababa University

digital library training center Kennedy library while, 5 (12.5%) of them said, they take training on computer and internet outside of AAU library in, NGO founded centers in Addis Ababa. They mentioned ATCB and IBM training centers. Still one respondent said he get training at Ethiopian national association of the blind centers. See table below.

Table 4.3.2 where did you get training on computer.

description		M	F	T	Percentage
1	AAU library	23(79.31%)	11(100%)	34	85%
2	NGO centre in AA	5(17.24%)	0(0.0%)	5	12.5%
3	ENAB centre in AA	1(3.44%)	0(0.0%)	1	2.5%
Total		29(100%)	11(100%)	40	100%

If the respondent had taken training in an areas mentioned above, then an attempt was made to know who sponsored those trainings. Table 4.3.3 below shows the sponsors who paid for the training of the respondents. Addis Ababa university library found the larger sponsor 34(85%) followed by NGO centers in Addis 5(12-5%) and 1(2.5%) by ENAB

Table 4.3.3. Who paid for your training on computer?

sponsor		M	F	T	Percentage
1	AAU	23(79.31%)	11(100%)	34	85%
2	NGO	5(17.24%)	0(0.0%)	5	12.5%
3	ENAB	1(3.44%)	0(0.0%)	1	2.5%
Total		29(100%)	11(100%)	40	100%

From those respondents who took computer training, information was gathered on type of their training covered for the question raised they provide more than one answers. As the response obtained indicates most of them take training on, introduction to computer, word processing, basic internet, and basic e-mail communication. Respondents who did not take training on computer and basic internet which provided or sponsored by Addis Ababa University were also asked the factors that limit them to take training

Of a total of 58 respondents 9(15.51%) of them said that they have shortage of time to take the training along with regular class attendance. 18(31.03%) complaint that is there is a shortage of training center in Addis Ababa university as well as in Addis Ababa city as a whole. One of the respondents said on an interview

> *"The training center in Addis Ababa University does not accommodate large number of trainees at a time."*

Most of the respondents said that the trainer is not a cooperative man to help them.

One respondent on an interview said.

> *"if we are late or absent for a single day the trainer will not accept as to the class and we have no chance to continuo except quitting the program the trainer is not dedicated to help us because, I think he lost his vision after time".*

From the respondent 21(36.20%) of them said they do not have awareness whether such opportunity exist to student with visual impairment or not. Still 10(17.24%) of the respondents raised personal case as a reason for not taking the training.

The table 4.3.4 below gives the detail

Table 4.3.4 If you are not taking training on computer what are the factors that limit you?

Factors limit		M	F	T	Percentage
a	Lack of awareness	6(22.22%)	15(48.38%)	21	36.20%
b	Shortage of training centre	11(40.71%)	7(22.58%)	18	31.03%
c	Time constraint	3(11.11%)	6(19.35%)	9	15.51%
d	Personal case	7(25.92%0	3(9.67%)	10	17.24%
e	Total	27(100%)	31(100%)	58	100%

4.4 Guidance service and awareness

At the awareness, stage, individuals learn the existence of the innovation (new idea) for the first time. He/she possesses only general knowledge about it. He/she, know very little about any of it special qualities and potentials. He/she lacks information about the innovation. If he/she is interested he/she can learn more about it. (Bekele, 1991 p. 23)

On this study an attempt was made to collect information on the awareness of the respondent on computer and internet usage. The respondents were asked whether they get guidance support to use computers or not. Of the total 40 respondents 16(40%) said that they have got guidance support before taking training on computer while 24(60%) said they did not get any guidance support from anybody else.

Table 4.4.1 Before training on computer have you got guidance support to use assistive technology?

Response	Sex			Percentage
	M	F	T	
Yes	9(31.03%)	7(63.63%)	16	40%
No	20(68.96%)	4(36.36%)	24	60%
Total	29(100%)	11(100%)	40	100%

After a valid response is obtained from the respondent that gets guidance support (awareness) support, it was necessary to ask them, who provide them this guidance support. Of 16 of the total respondent 4(25%) said that Addis Ababa University create awareness to use computer and internet, while 9(56.25%) of the total respondent said that their friends told them to take training. Still 3(18.75%) said that both Addis Ababa university and friends gave them the awareness to use such technologies. Table 4.1.15.shows this in detail

Table 4.4.2 Who provide you guidance support?

Guidance providers	Male	Female	Total	percentage
1. AAU	1(11.11%)	3(42.85%)	4	25%
2. friends	7(77.77%)	2(28.57%)	9	56.25%
3. AAU & own friends	1(11.11%)	2(28.57%)	3	18.75%
Total	9(100%)	7(100%)		

As can be seen from the table friends have taken high credit in awareness creating to use computer and internet among visually impaired student, and followed by Addis Ababa University. Addis Ababa University takes the least credit in awareness creating. Creating awareness to the people, about the existing technology and the opportunities it provides is one of the ways of helping such peoples. When people award of some technology they develop an interest on it to use it or investigate it. The initial orientation helps students to secure information about the nature of training and about the new technology. On the issues of awareness creation, an interview summary of the librarian is as follows.

> *Creating awareness of the existing technology to the people with visual impairment is one of the issues to be considered. Addis Ababa University always at the beginning of the year gives orientation to the entire student to create awareness about the situation of the campus (respondent from the library of A.A.u).*

The general manager of Adaptive technology center for the blind (ATCB) Identified "awareness" of the people about the existing assistive technology to the people with visual impairment as follows.

> *"When I came back to Ethiopia from Canada in 1999 to open this project, the project that provides training service to PWVI the awareness level of the people about the technology is almost nil. It seems an illusion to all the people not alone to the PWVI but also to those who are educated too. The awareness of the people increased after the some student get trained and start to use the computer by the use of the assistive technology. Still there is a gap in awareness level among peoples. However our center works to*

create awareness. For that purpose, to create awareness to the university student who have visual impairment we translated different books to Braille books, even the book written on disability in Ethiopia by professor Tirussew is translated to Braille book I think this is one of the way to create awareness.

As the document of united nation indicates counties should create awareness about the new technology available to people with the disabilities. If people get awareness about the existing technology thy develop interest on it and then make decision to test and use the technology. The student with visual impairment at AAU lacks awareness about the new computer technology. Of the total respondent, 63(68.47%) do not have awareness about the new technology to person with visual impairment. Even if it is not adequate awareness level of the student with visual impairment about the new computer technology increased after they joined the university. As the seen from the table there is statistically significant association between awareness and the computer ability of the student.

4. 4. 3 Computer Skills and Awareness of New Technology

		Can you use computer and internet for your information needs?		Total	Chi- square
		Yes	No		
Do have awareness of using computer and internet for information needs	Yes	23(79.31%)	32(50.78%)	55(59.78%)	$x^2 = 6.717$
	No	6(20.68%)	31(49.2%)	37(40.21%)	Df = 1
	Total	29(100%)	63(100%)	92(100%)	P = 0.01

4.5 Barriers to access to information need

This sub-section seeks to find out the possible obstacles faced by student with visual impairment in the usage of computer and internet for their information needs. In this sub- section a series of questions were asked to each respondent and the respondents was required to express his/her agreement or disagreement regarding the reasons for lack of access to computer and internet.

The first barrier to access to information mentioned to the respondent was "cost of access to computer and internet connection is very high". As can be seen from the table below, 79(80.61%) of the respondent agree, 5(6.32%) of the respondent disagree, while 14 (14.28%) of the respondent unable to decide or they are not in position to pin- point. The majority of the respondent said that the cost of computer and Internet connection is very high outside Addis Ababa University.

Table4.5.1 Do you agree that the cost of access to computer and internet service outside AAU is very high?

	Observed N			Chi-square
Sex	Male	Female	Total	X^2 =105.438
Agree	50(89.28%)	29(69.04%)	79(80.61%)	df=2
Disagree	3(5.35%)	2 (4.76%)	5(5.10%)	P = 0.000
Neutral	3(5.35%)	11(26.19%)	14(14.28%)	
total	56(100%)	42(100%)	98(100%)	

The second reason mentioned as barrier to assistive technology was "limited public assistive technology facilities access to PWVI." Out of a total of 98 valid responses obtained, 92(93.87%) of the respondents agree with the statement, one respondent 1(1.02%) disagree, with the statement that limited public assistive technology facilities are one of the barrier. (6.32%) were neutral as to this being the barriers to get service by VIPs. Details are presented in table 4.5.2

Table 4.5.2 limited or lack of assistive technology facility in the public service is one the barriers to get training on it.

	Observed number			Chi-square
Sex	Male	Female	Total	X2 =161.898
Agree	53(94.64%)	39(92.85%)	92(93.87%)	df=2
Disagree	0(0.0%)	1(2.38%)	1(1.02%)	P=0.000
Neutral	3(5.35%)	2(4.76%)	5(5.10%)	
Total	56 (100%)	42(100%)	98(100%)	

"Lack of awareness of the existing technology" was another possible barrier to limit visually impaired student to get information. As can be seen in table below, out of the total 98 respondents, 58(59.18%) agree with statement, 11(11.22%) disagree with the statement mentioned and 27(27.55%) unable to determine whether this is the barrier or not. The interview made with general manager of ATCB is summarized as follows

> *"Our center provides training on computer to any people who have visual impairment without any charge. Rather, our center pay back to the trainee's transportation cost, our aim is to help such students".*

Even though ATCB center said this, most of the student does note knows the existing of such training in Addis Ababa city to people with visual impairment.

The table below indicates this in detail

Table 4.5.3 PWVI lacks awareness in use of technology.

	Observed N			Chi-square
Sex	Male	Female	Total	$X^2 = 34.429$
Agree	28(50.00%))	30(71.42%)	58(59.18%)	df = 2
Disagree	6(10.71%)	5(11.90%)	11(11.22%)	P = 0.000
Neutral	22(39.28%)	7(16.66%)	29(29.59%)	
total	56(100.00%)	42(100.0)	98(100.0%)	

"Inadequacy 0f training access on AT for PWVI" is one of the reason mentioned as a barrier to PWVI. To use technology for their information need. Out 0f a total 0f 98 respondents, 91 (92.87%) agree with the statement, 1(1.02%) disagree with the statement and 6(6.12%) 0f the respondent was neutral to the statement as they was unable to determine it. As can be seen on table below, "The training access on assistive technology to PWVI is not adequate".

On an interview one student said the following.

"The training center of AAU to student with visual impairment on assistive technology is not adequate. It accommodate few students at time even the trainer do not have adequate skill on computer operation, now the trainer stops providing the training due to the reason we do not know. And we the visually impaired student start helping each other"

Table 4.5.4 Training access on AT is inadequate to PWVI.

	Observed N			Chi-square
Sex	Male	Female	Total	$X^2 = 156.633$
Agree	51(91.07%)	40(95.23%)	91(92.85%)	df = 2
Disagree	1(1.78%)	0 (0.00%)	1(1.02%)	P = 0.000
Neutral	4(7.14%)	2 (4.76%)	6(6.12%)	
total	56(100.0%)	42(100.0%)	98(100.0%)	

Another barrier to access to information was "in accessibility of web pages to the people with visual impairment" among the total 96 respondents, 25(25.51%) agree with the statement mentioned, while significant number of respondent 27(27.55%) disagree, with the idea proposed. And still 46(46.93%) unable to determine whether "in accessibility of web pages" is one possible barrier to PWVI to get access to the technology while still a large number disagree with it.

An interview conducted with post graduate law student is summarized as below.

I do not think that there is inaccessible web page to people with visual impairment. The technology usually works to make computer technology accessible to PWVI; the problem is the introduction of the new innovations to the people that is in need of it". I think it the problem of bringing such technology to this country"

Table 4.5.5 Many web pages on computer is inaccessible to PWVI

	Observed N			Chi-square
Sex	Male	Female	Total	$X^2 = 8.224$
Agree	16(28.57%)	9(21.42%)	25(25.51%)	df = 2
Disagree	19(33.93%)	8(19.04%)	27(27.55%)	P = 0.016
Neutral	21(37.50%)	25(59.52%)	46(46.93%)	
Total	56(100.0%)	42(100.0%)	98(100.0%)	

The next barrier to the actual use of computer and internet technology is may be a fear of technology on side of PWVI. "Fear of technology mentioned to the respondent, out of 98 respondents, all of them 98 (100%) said that they disagree with statement mentioned, and fear of technology can not be barrier, to use computers and internet for their information needs.

Another obstacle to access to use computer and internet mentioned to visually impaired students at AAU to investigated was "inadequacy of the number of trainer on AT at AAU." As can be seen in table 4.1.21 below, out of the total 98 respondent 91(92.87%) agree, with the statement, said that lack of enough trainer on adaptive technology in one of the obstacle that limit them to be trained on computer to use internet effectively. while 1(1.02%) disagree, to the statement with opinion that, the number of trainer can not be a limiting factor, However still 6(6.12%) were not able to determine /give their opinion, whether shortage of trainer can be a limiting factor or not.

Table 4.5.6. The number of trainer on AT in AAU digital library is insufficient

	Observed N			Chi-square
Sex	Male	Female	Total	$X^2 = 156.633$
Agree	50(89.28%)	41(97.61%)	91(92.85%)	df = 2
Disagree	0(0.0%)	1(2.38%)	1(1.02%)	P = 0.000
Neutral	6(10.71%)	0(0.00%)	6(6.12%)	
total	56(100.0%)	42(100.0%)	98(100%)	

As one of the limiting barrier, mentioned to the respondent was "Digital library training center of AAU is not sufficient to accommodate VI students". As can be seen in table below the respondents give their reaction to the opinion mentioned above. Accordingly out of the total respondent 92 (93.87%), agree with statement to reflect their view that the existing training center is not enough to accommodate large number of students with visual impairment. 1(1.02%) disagree with idea that the training center is not sufficient. While 5 (5.10%) was unable to tell whether it is enough (sufficient or not.)

Table 4.5.7 AAU AT training center is insufficient to accommodate

	Observed N			Chi-square
Sex	Male	Female	Total	$X^2 = 161.898$
Agree	52(92.85%)	40(95.23%)	92(93.85%)	df = 2
Disagree	0(0.00%)	1(2.38%)	1(1.02%)	P = 0.000
Neutral	4(7.14%)	1(2.38%)	5(5.10%)	
Total	56(100.0%)	42(100.0%)	98(100.0%)	

The other reason mentioned as a barrier to take training on computer usage was "I have time constraint to take training on computer". For this opinion, the respondents reacts differently; 71(72.44%) of the respondent agree to indicate that time shortage is one of the barrier that hinders visually impaired students to take training on computer. Significant number of respondents 23(23.46%) disagree with the opinion while 4(4.08%), was unable to determine whether this is barrier to get access to training or not.

One of the respondents on an interview said the following

> *"I started training on computer usage but I soon stopped it because it very difficult to take the training side-by-side with regular classes. For me it has been challenging so that is why stopped it."*

Detail in given below

Table 4.5.8 "I have time constraint to take training on computer"

	Observed N			Chi-square
Sex	Male	Female	Total	$X^2 = 79.000$
Agree	40(71.42%)	31(72.44%)	71(72.44%)	df = 2
Disagree	13(23.21%)	10(23.80%)	23(23.46%)	P = 0.000
Neutral	3(5.35%)	1 (2.38%)	4(4.08%)	
Total	56(100.0%)	42(100.0%)	98(100.0%)	

4.6 Promoting assistive technology accessibility

Once the status of assistive technology utilization of student with visual impairment and the problem they faced on getting training in using assistive technology device for their educational purpose was determined, it is natural to deal with the issues that help promote assistive technology accessibility to student with visual impairment in general. Therefore, in this part the opinion of student with visual impairment was investigated by raising questions related to the issues of promoting of assistive technology to the visually impaired respondents. One of the issues assumed to promote AT accessibility was " Assistive devices should be introduced by improving access of PWVI." Out of a total of 98 respondents with visual impairment at A.A.U 93 (94.89%) agree, while 1(1.02%) disagree with statement. 4(4.08%) of the respondents neutral to the opinion raised.

Table 4.6.1 Assistive devices should be introduced to improving access of PWVI.

	Observed N			Chi-square
Sex	Male	Female	Total	
Agree	53(94.64%)	40(95.23%)	93(94.89%)	$X^2 = 167.286$
Disagree	0(0.00%)	1 (2.38%)	1(1.02%)	df = 2
Neutral	3(5.35%)	1 (2.38%)	4(4.08%)	P = 0.000
Total	56(100%)	42(100.0%)	98(100.0%)	

The second reason mentioned as an issue to promote AT accessibility to student with visual impairment was" "The existing curriculum for visually impaired should contain AT training" 91 (92.75%) agree, in support of the idea raised and 3(3.06%) disagree with the idea proposed to them. And still 4(4.08%) of the respondent are neutral to the statement as they cannot determine it.

Table 4.6.2 "The existing curriculum for visually impaired should contain AT training"

	Observed N			Chi-square
Sex	Male	Female	Total	$X^2 = 156$
Agree	50(89.28%)	41(97.61%)	91(92.85%)	df = 2
Disagree	2(3.57%)	1(2.38%)	3(3.06%)	P = 0.000
Neutral	4(7.14%)	0(0.00%)	4(4.08%)	
Total	56(100.0%)	42(100.0%)	98(100.0%)	

Finally an issue raised to the respondents to promote AT accessibility was "Visual impairment should be considered in AT research". Out of 98 respondents, 90(91.05) supported the idea while, 8(8.16%) of the respondents were not able to determine whether visual impairment is considered in AT training or not.

CHAPTER FIVE

5. Discussion

The finding in relation with research questions and theoretical assumptions will be discussed and interpreted in this chapter.

The academic performance of the student with visual impairment in higher education learning is negatively affected by factors such as educational materials shortage of other facilities or services and in convenience that interfere with their pursuit and achievement (Keralem 2005).

Blind students encounter several problems. In this aspect the major educational problems of the blind students were inflexible and non- inclusive curriculum, in compatibility of teaching approaches with learning styles of blind students, lack of instructional materials (Braille, Tape records, Taking books), specialized materials (Perkins Braille, Braille type writer, computer hardware and soft ware equipments), insufficient instructional support, lack of special service such as guidance and counseling, orientation and limited access to ICT (Sisay, 2007)

Since the introduction of internet as a source of information, the teaching styles at higher educational level like Addis Ababa University have been changed. Learners are expected to perform a great of learning by themselves. Learners are expected to explore knowledge by themselves using different resource materials, including the resource materials provided through Internet world wide. At this technological age students at higher education needs internet services even to do term papers. Students with visual impairment too need internet services as their counterparts. To get equal access and opportunity they should have to have awareness and skill to use the technologies.

5.1. Awareness of Computer Technology to SWVI

The literature states that countries should recognize the significance of having awareness about the available assistive technologies to the people with disabilities. The united nation document on standard rules on equalization of opportunity for persons with disability states that "states should ensure that responsible authorities distribute up-to date information on available programs and services to persons with disabilities, their families professionals in the field and general public". Awareness rising is the responsibilities of the states or governmental and non-governmental organization about the availability of the technologies to PWVI.

5.1.1. Awareness of SWVI about computer Technology before joining AAU

As the study point out, the visually impaired student at Addis Ababa University lacks awareness about the existing computer technology to PWVI before coming to AAU. Out of the total respondent only 3 (3.06%) of the respondent have the information that a blind person can use computer which suit to their special needs, when they are in secondary schools. The lack of awareness of what technology is available to person with visual impairment can be associated with lack of information on new technology among the school leaders themselves. Computer at secondary school level is used only for office purpose to prepare examinations. Peoples don't know what computer dos or do not do to the peoples with visual impairment. The new technology on computer to person with visual impairment introduced to Ethiopia in recent years so as the survey study done by EICTDA (2007) indicates the concerned bodies do not disseminates information to the people with disabilities on time. As doctor Tamiru, from ATCB center said this new computer technology introduced to Ethiopia recently after his organization opened an office in Addis Ababa.

5.1.2. Awareness SWVI about computer technology after joining AAU

Awareness level of the student with visual impairment at Addis Ababa University a bout the new computer technology to PWVI have been increased after joining AAU. Out of the total respondant33 (33.67%) of the respondent have got awareness about the technology after joining AAU. In awareness creating about the new computer technology to visually impaired students at Addis Ababa University, the university and own friends of visually impaired students plays a major role. The statistics on the study indicates that there is a difference in awareness level between male visually impaired and female visually impaired students. Male student are found having more awareness about the new computer technology than female students. This difference in level of awareness is associated with negative attitude of the girls about computer as Evans (1997) indicates on study of gender difference on computer literacy. As the research indicated, male students are very interested in how technology works while female students tend to focus on how the technology is used. Out of all, 98 respondents 60 (61.22%) of the respondent do not have an awareness about the computer technology to visually impaired person. On the issue of awareness the responses obtained from the student and the response obtained from the librarians and ATCB center is not the same. The librarian said that they provide orientation to the entire student on their arrival to the campus about the available services to the entire student. The ATCB center on other side said they try to create awareness about the new technology by translating different books into Braille materials to the university and different organizations. The center believes that this is one way to create awareness to the people with visual impairment. As the study result indicates there is statistically significant association between awareness about the new computer technology to PWVI and computer skill of the respondent. Those who have prior awareness about computer technology are found being more computer users(see table 4.4.4). According to the observation of the researcher

- By one day orientation it is not possible to create awareness among visually impaired students about the new technology available to them.
- The way ATCB center tries to create awareness about the new technology to the person with visual impairment is not the proper way.
- There is no awareness creating services on technology innovations at lower grade levels/secondary schools.

On this issue one of the respondents on an interview reported the following.

> *"Before I came to Addis Ababa University I do not know whether a blind person can use a computer by himself or not without the assistance of an other persons. But I was able to know the reality that computers can also be used by persons with vision problems."*

5.2. Guidance Support

The institutes of higher education, which has a highly developed guidance programme, will find it exceptional students assisted in many aspects throughout the regular operation of that program.

According to Yosuf (1998) cited in Amare (2004) guidance and counseling are historically, professionally ethically and technically different. The ultimate objective of guidance and counseling is the same.

Their objectives are to serve students. According to Bennett (1963), the word guidance is used here to include all those services, whether on an individual or group basis that contribute to the individual growing, understanding of himself /herself, his/ her developing self- concept, his/her abilities, his/her physical, mental, social maturity his/her personal and social needs for optimum development and achievement as a unique person and democratic citizen.

UN, document on standard rules on the equalization of opportunity for persons with disabilities states that, states should ensure the provision of

assistive devices and equipment, personal assistance and interpreter service according to the needs of persons with disabilities, as important measurers.

Article, 2 of the statement state that, state should support the development, production, distribution and servicing or assistive device and equipment and the dissemination of knowledge about them.

As the study points out the visually impaired student at Addis Ababa University lacks guidance support to get information on technologies available to PWVI. Out of the total respondent who use computers only 16(40%) have get guidance support from special needs department of Addis Ababa University. This indicates that the guidance provided in the university is not planned and programmed to include all the visually impaired students. As the response obtained from the student indicated, such a guidance services in the campus is promising.

However there is statistically significant association between the guidance support and computer skill on how to use computer by visually impaired student in the university. The majority of the respondents who have got guidance service are found having computer training and skills. Out of the total computer users/or who have computer skill 75% were those students who have prior guidance service either from the universities or their own friends. Providing guidance services to all students, especially to the student with visual impairment upon their arrival to the university should be taken into consideration by the concerned bodies. Student with disability have the right to get information's about the new technology invented for them.

- As the response obtained from the student there is no well organized guidance support provided to the SWVI in the campus
- Own friends of visually impaired student's plays a great role in awareness creating about the available services to SWVI.
- The guidance support provided to VIS at AAU is inadequate.

5.3. Access to Computer Training

The Internet and other online services are new technologies that open up windows of opportunity for every one to participate in the new information, age, and that there are particular benefits and potentialities for peoples with disabilities. The Royal national institute for the blind (1998 n.p) in the UK stated that "the internet is one of the most significant developments since the invention of Braille, because for the first time every many blind and partially sighted people have access to the same wealth of information as sighted people and on the same terms." Lewis (2004) classifies access technologies to visually impaired persons into three basic types, which are visually enhancing, audio based, and touch-based. In order to get access to information through Internet, some one should have to have computer training to use the technologies.

As the study point out student with visual impairment at Addis Ababa University lacks access of training to the new technology outside Addis Ababa University in public service. For the majority of the student who has the training on computer was unable to identify where such computer training is provided out side Addis Ababa University.

Out of the total respondent who have computer skill /training, only 6(15%)(see table4.3.2) have got training out side Addis Ababa University at the centers known as ATCB and IBM. The rest of the respondent 34(85%) have trained in Addis Ababa university training center at sidisk kilo campus. As the study result indicates there is scarcity of training center on computer on adaptive technologies in Addis Ababa. The study revealed that there are limit training centers on adaptive computer technology out side A.A.U to person with visual impairment.

As the finding of the study indicates training on computer skill provided by Addis Ababa University is inadequate, the majority of the students does not take or have computer training.

The respondent raised different reasons for scarcity of computer training to the student with visual impairment

- Shortage of public training center as an alternate
- Shortage of skilled man power who provide such training (only one individual assigned to give training to SWVI at AAU)
- In adequacy of training center of AAU library
- Lack of attention by administrators on the training program intended

On an interview one of the respondent said

> *"I was started taking computer training in the university training center but I stopped it after a week because of my own reasons. I have a mobility problem in the comps, I was late from training one day, the trainer angry with me, he said a lot that I can not mentioned here again he's saying touched my moral. I think he becomes blind after a time and that is why he was angry with us, then finally stopped the training"*

As the above respondent and others reported on an interview they have psychological problems to take training given by the trainer assigned in the center. Another respondent said:

> *"The trainer who assigned to give on computer training is not a cooperative man when we late from training for a single day he will not allow as to continue training, I think he do not know who we are!!*

The manager of Adaptive technology center for the blind (ATCB) whose office is found at piazza said that, their organization provides different kind of training to people with visually impairment, starting from mobility training to the computer training in their training center which was found near Ras Desta Hospital in Addis Ababa.

As the manager said the main objective of their organization is helping visually impaired individuals to get orientation and be self-sufficient. The

center trains university dropouts or school dropout student with visual impairment to make them economically self-sufficient. The manager said.

> *"we provide computer training to university students we also provide to visually impaired citizen on assistive hardware like Braille embosser; Braille embosser is a device that change books to Braille books with in short period of time. The manager further reported that his organization translated some books to Braill books to AAU libraries".*

Most visually impaired students at AAU do not know the existence of this training center.

Access to training is also a function of availability of the training centers for accessible computer training. Most, respondent was unable identify another training center except Addis Ababa University. Very few 6(15%) have mentioned that they take training at ATCB, IBM and ENAB training centers.(table 4.3.2)

The majority of the respondent 85% the computer users, visually impaired student are those who take computer training at AAU. Addis Ababa University as a higher educational institution plays a great role in providing computer skill training to the SWVI.

Information dissemination on technological innovations is the responsibility of the higher educational institutes like Addis Ababa University, governmental and non-governmental organization. On this regard even if the training it provides is in sufficient AAU have done good practice in providing a new technology to the people with visual impairment.

As the study result indicates

- The majority of the student with visual impairment at AAU cannot identify the other training center on computer to PWVI except AAU center.
- AAU takes a larger credit in providing computer skill to the student with visual impairment. The majority of the computer uses take the training at AAU training center.

- AAU, as higher institute plays a great role in disseminating information on the new computer technology.
- There are limited training centers on assistive computer technology to PWVI in Addis Ababa.
- As the response through interview and questionnaire revealed the training center of Addis Ababa University is not adequate enough.
- There is one trainer in the university who gives training on computer to SWVI. This is may be one factor that limits the student to take training on computers.
- Some visually student wrongly understood the benefit computer. They thought as if computers are only used by certain department
- The university administrator's do not give attention to the training programs.

5.3.1. Access to the available Technology

Literature confirms that technology has opened doors of opportunities for learning; the fact is that the majority of the population on the world does not have access to these technologies Chandra (2002) as cited in "digital divides" explained. "If access to the WWW is to be defined as a criteria for joining the information age then about 2% of the worlds population of 6 billion people have gained access to it by the year 2000. "Indeed the internet may be changing every thing for those who use it, but it is still doing nothing for 19 out of 20 people on our planet." According digital divides accessibility is an economic issue. The rapid growth of on line programs (Internet) program have given the opportunity for learner with different back ground to improve their educational qualification and career enhancement. However, the literature reveals that technology is not accessible to all. As cited on digital divides Burgstahler (2003) said, even the computer technology has allowed people with disability to function relatively independently there is still stop by a number of barriers to computer use.

According to Dragulanecu (2002) as cited in "digital divides," The information and technology gap and related inequality between industrialized and developing countries are widening:- he call it "a new type of poverty – information poverty – looms." "While in US one computer is shared by only two people in Africa one computer is shared by 6000 people.

As the literature confirms there are different assistive hardware and software technologies that can be accessed by visually impaired person for their information needs. It is only possible for blind or visually impaired people to gain access to information provided through WWW because of the availability of the technology, which enlarge text or convert the information in to audible or tactile media. As the responses obtained from the student indicates, the visually impaired student at Addis Ababa University used only the screen reader software, for their computer and internet application. The librarian at AAU supported the idea by saying that computer loaded by screen reader soft ware is enough for visually impaired students for the purpose they needs computer.

As the librarians reported the screen reader software is more convenient for visually impaired students for the purpose they need the computers. The study result agree with work of Lews(2004). On his study on 581 blind and partially sighted individuals, he confirms that 38% of computer users' use screen reader software.

As the study point out, the student with visual impairment at AAU limited to single assistive software to use computer and Internet. The countries experience indicates that screen reader is the most accepted technology for visually impaired person in general. As the literature indicates using only one assistive technology is not a problem to student with visual impairment.

One major barrier to access of PWVI to the modern information technologies such as computers, Printers, and Internet is unsuitability of the technology itself particularly its design features. Disability movement around the world

has been calling for accessible design so that the functionalities and contents of modern technology product and services are accessible to PWVI. But this is not the focus of this study. Evaluation of technology is beyond the scope of this study.

❖ Using one kind of assistive software technology is promising.

5.3.2.Computer Skills

The academic performance of the student with visual impairment in higher learning is negatively affected by factors such as educational materials shortage of other facilities or services, and inconvenience that interfere with their pursuit and achievement (keraleme 2004), Gebrie (1992) as cited in keraleme, stated that people with visual impairment faced difficulties, of lack of educational material, department choice are limited and it depends on good will of the respective department. Computer skill is one of the criteria for the employment in general. Governmental and non- governmental organizations put a computer literacy as a criterion to hire an individual. Peoples with visual impairment were vulnerable to such employment criteria.

As the study points, out the student with visual impairment at Addis Ababa University have limited skills on computer usage. Out of the total 98 respondent only 35(35.7%) have the skill to use computers and Internet services, the majority 63(64.28%) of the respondent does not have a skill to use computer and Internet. Out of the total computer users 14.28% used it by assistance of another person either librarians or own friends with normal vision. 22.85%, of the computer users used it by themselves and with the assistance of other person. The rest, 62.85% used it unassisted by themselves. Significant number the respondents said that they used the computers either by themselves or by the assistance other person. This can be associated with lack of effective training or the design problem of the technology itself.

Computer skill in higher education is very important. The student in higher education use Internet service to do their term papers and thesis, because Internet provides up-to-date information for those who use it. The visually impaired student are not excluded they need the Internet service too. The student with visual impairment should have the equal opportunity to use the technologies; this is the idea support by the member countries of the world.

There is statistically significance association between computer skill and genders of the respondent out of the total respondent who have computer skill and use computer and internet 26 (74.28%) were male visually impaired student. The rest 9(25.71%) computer users are female visually impaired student. This difference is directly associated with awareness difference between the male and female visually impaired computer users. It is also related directly to the department selection of the student. The respondent on an interview suggests that some department frequently use the Internet while the other department does not use Internet service for their information.

On an interview one of the respondent said

> *"I did not take computer training because in our department we do not need computer and Internet service this much. I relay on class instruction notes for my examination. So computer skill/literacy has no relation with my department I think computer skill is very much helpful for law faculty students. I found them, using the computer and Internet continuously.*

As the report of interview indicates the student WVI have miss understanding about the computer service. They associated need of computer skill to the department selection. They thought as if computers are used. Computer and Internet usage skill is crucial for every body whether he is from language department or any other field of study.

As the study revealed there is also a significance relation between computer skill and educational level of the respondents. Senior students have found more computer and Internet users or have computer skill than junior

students. 48.57% of the computer users are fourth year students and, 11.42% are second year students.

Generally out of the total computer users 60% of the students were from fourth year and above and 88.57% of the computer users were from third and above. This difference is directly associated with lack of awareness on the side of visually impaired students about the new computer technology to PWVI at secondary school level. Again it also associates with adaptation problem of junior students to the university campus. On an interview most of the junior students were claimed that they have time constraint to take computer training. For senior students the life they spent is the campus helped them to adapt to the regular operation of the university to take computer training and develop interest on Internet usage.

The finding result reveals that:

- ❖ The result obtained on this study agree with the finding of Mutula (2008) in Botswana. This study revealed that males dominate in computer and usage when compared to women.
- ❖ The study reveals that, computer skill and educational level of the student have direct relation. Senior students are found more computer users and have more computer skill than junior students. The result may associated with:
  - Adaptation problem of the junior students to the environment of the university and lack of awareness or orientation when they are at secondary schools.
  - Load work of the senior students have to be assisted by online information.

5.4. Barriers to access to Information need

A series of questions were asked to each respondent and the respondents were required to express his/her agreement or disagreement regarding the reasons for the lack of access to compute and Internet service.

The first barrier to access to information mentioned to the respondent was the cost of access to computer and Internet connection. The respondents forwarded their opinion on the issue raised. The date was analyzed by SPSS software

As the table 4.5.1 indicates, the chi-square critical value (df=1) of each item at p=0.0005 level of significance is 12.12,however the chi-square observed value of each item exceeds the chi- square critical values. Therefore the observation of the students with visually impairment about the cost of computer and Internet connection is significant. There is a problem on cost of computer connection to people with visual impairment and university student.

The other question raised under this subsection was the limited public assistive technology facilities access to PWVI. As the table, 4.5.2 reveals, the chi- square critical value, with degree of freedom 2 of each item at P= 0.0005 level of significance is 15.20. The chi-square observed value of each item exceeds chi- square critical value.

Therefore the student's observation about the public assistive technology facilities to PWVI is significant.

The chi- square test revealed that the chance of obtaining a value of $x^2 \geq 77.04$ is extremely small that is less than 0.0005. Thus the question raised as a barrier to get access to computer and internet, is positive. The lack of public service on assistive technology limited the access of visually impaired students to the technology.

Lack of awareness of the exiting computer technology to visually impaired person was among visually impaired persons is one of obstacle to get access to computer and Internet service because the hypothesis and the observed date collected significantly related.

The chi-square test revealed that the student's observation of lack of awareness on existing new computer technology is significant.

There is a shortage of training center on adaptive technology to the people with visual impairment. As the study indicates there are three centers that provide computer training to SWVI. Among these three Addis Ababa University training center gives a larger part of training to the visually impaired individuals. The majority of the students who take training on computer skills get training by Addis Ababa University.

If Addis Ababa University does not open a training center in the university the student do not have the alternative center to take computer training.

As the chi-square observed value is larger than the chi-square critical value with df = 2 at p=0.0005 level of significance, the student observation of the problem is significant. The hypothesis "training access on assistive technology is inadequate for PWVI is positive (refer to table4.5.4).

The other questions raised as barrier to get access to the information through internet is an accessibility of many web pages. As the (table 4.5.5), indicates the chi-square observed value is less than the chi- square critical value with df = 2 and p = 0.0005 level of significance.

Therefore the observation of the student about the question raised is insignificant. The question of inaccessibility of many web pages to the PWVI has no relation with information need of a PWVI. In accessibility of the webpage cannot a barrier for the information needs of the student with visual impairment.

On this issue one of the respondents reported the following.

> *"I don't think that any web page cannot be accessible to the individuals with visual impairment but the problem is that, all in*

all the new technology is not introduced to our country, the problem is may be due to this. If visually impaired Ethiopians have lack of access to the certain wave pages may be peoples with visual impairment at developed countries do not have access problems."

5.5. Technology dissemination

Three questions were asked to investigate the way the technology to be disseminated to the people with visual impairment. The study participant was asked to forward their opinion how to disseminate the existing computer technology to the people with visual impairment. The key method to disseminate the existing computer technology to PWVI is to make it accessible to VIPS. The government and organization service should maintain this. The first questions raised to disseminate the existing computer technology to the people with visual impairment were introduction of the computer technology to PWVI. The idea here is that if such technologies are introduced to PWVI, the access of PWVI on the technology may increases. On this issue chi-square observed value df = 2 at p = 0.0005 level of significance is quite high, greater than the chi-square of critical value with df = 2 at level of p = 0.0005 level of significance that is (X^2 = 165.289) (table 4.6.1). Therefore the observation of the student with visual impairment about the method of dissemination of the technology is significant. This means that to disseminates information to the public in general and to people with visual impairment in particular about the technology available to the people with visual impairment can be possible by introducing the technology exist to them.

The other method to disseminate the existing computer technology to PWVI was by making the curriculum of visually impaired person to contain the assistive technology training like computer skill. The current curriculums of the student with visual impairment do not contain computer training. But if there should be computer training when they at secondary schools or special schools for the blind the computer skills of these students may increase. And therefore their access to computer technology increases. In this issue the idea

forwarded the student with visual impairment about the total inclusion of assistive technology training to PWVI has got a strong sport from the respondent. As the data analyses indicate the chi-square observed value of this item is very high that is 156.265 at p = 0.0005 level of significant therefore, the respondent observation of the idea is significant. As a result, putting assistive technology training as one of the curriculum content is a key way to disseminate the computer technology to the people with visual impairment.

- Hand in hand with advancement technologies that assist people with visual impairment to get the information they needs for the educational advancement, their curriculum should be modified to accommodate the special training needed.

A Case Report

In this study I have tried to include the biography of my study participant which will be organized as follows.

The name of the study participant is Zega. He was born from peasant family, from his mother Alem and his father shumat on April 15 1970. He was the second son in birth order. It was at the age of seven he lost his sight because of smallpox. In order to intervene his visual impairment, his parents took him to different Orthodox churches monasteries, Awaki-bet (native doctors) for year. However, the effort done by his families to cure him brings no change in his health rather things become worse and intolerable. His parents were not willing to take him into health centers and hospitals because of long prevailing belief and tradition that the cause of visual impairment was the work of evil punishment to wrong done by one of his ancestors. As a result his parents lost courage and began to regret not to complain in intervening in the work of their God

Early Childhood Life

In his childhood, time all his families members and neighbors narrated to him that he was more active, to explore his surrounding. He was moving from one village to other village alone independently. Most of the time, his character was described by playing foot ball made from pieces of cloth, participate in ritual dancing and highly in yegena chawata (Christmas game) which demand him running her and there. He was even after he have got visual disability, he was collecting firewood moving into the bush, keeping cattle, sheep and goat and come back safely. Therefore, his parents were in good terms in showing love, respect due to his sharing their burden.

School Life

His parents were very much interested that he would be the church school student and later to be locally known Meri-Geta (his master). Then he was made to join in to his village church school and attended reading school for six months. However, because of repetitive corporal punishment from church school teacher Yeneta, he hated the education system. But the teacher has told him that he still regrets even now to miss him because he speaks that he was one of the clever student in oral recitation psalm of David.

Then when he was a 12 years old boy his uncle brought him to Ethiopian national association of the blind in Addis Ababa. Then he has got the opportunity to join into primary school for the blind in Wollaita Sodo at the place called Ottona. He attended the school from 1980-1986. He took the national examination of sixth grade and scored 100 percent. Then he was promoted into ligaba Beyene secondary school in which blind and sighted students learn integrated in the same school. When he was reached grade nine, the Ethiopian National Association of the Blind allowed him to be

transferred to Addis Ababa to attend his high school. He was paid sixty Birr as a stipend from the Ethiopian National Association of the Blind to complete secondary school education. He complete grade twelve in 1990. The GPA he scored in the national examination in grade twelve helped him to join into Kotebe college Teacher Education in diploma program. After he completed his training in the field of History, he was employed in the Ministry of Education as a teacher sent to rural Ethiopia being from 1992. He was stayed in teaching services for four years. He came back to Kotebe College of teacher education to continue advanced degree program in the same field. He joined the college in 1997 and received his first degree in 1999. After he had been graduated from this college, he has got the chance to be assigned to teach in the Addis Ababa by educational bureau starting from 1999. At present he has got 14 years of teaching experience. He teaches history and civic education. In order to manipulate his work effectively he began to search for training centers which provide him basic computer skills to use computers for different purpose he needs it. Finally he succeeded and got that training center. The training center he got was Adaptive Technology Center for the Blind (ATCB). He was lucky enough to have access of training in the (ATCB), center in Addis Ababa. He takes the training for three months and received the certificate from the center. The courses offered by the center include: introduction to computer, word processing, formatting and editing, email, excel programs. Now he can use the computers without the assistance of the other person by himself. To prepare test papers, examinations and teaching materials he does not need assistance, he can do it by himself. The training he takes capacitated his potential, develops his confidence and self-esteem. This year he will graduate from Addis Ababa University with Masters Degree. He prepared his Thesis paper by himself. Now he has two computers a laptop computer and office computer loaded screen reader software (jaws). He said that the computer loaded with screen reader software comfort him to do any thing he wants to do.

CHAPTER SIX

6. Conclusion and Recommendation

The objective of this study is to assess the accessibility of the assistive software and hardware technologies to the student with visual impairment at Addis Ababa University. The study involved 98 student with visual impairment from Addis Ababa university, the librarians from Addis Ababa university and the experts from adaptive technology training center for the blind(ATCB).

In this study, attempts have been made to provide answers to the following basic research questions.

- Do the students with visual impairment at AAU have access to the assistive software and hardware technology?
- Do they have computer skill to use assistive technologies available?
- For what purpose do they use; and how do they use the assistive hardware and software technologies?
- What are the factors which limits the student to use assistive software technologies?.

In order to deal with these research questions the related literature is reviewed, with help of questions raised and based on the analysis of data the following conclusions is drown:

Conclusions

1) Students with visual impairment at Addis Ababa University lack awareness about the new computer technology to PWVI. There is statistically significant association between awareness of the new computer technologies and the computer skill of the student. The larger percent of the computer users are those students who have awareness about the new technologies available to them.
2) The computer training to SWVI at Addis Ababa University is in adequate due to different reasons, lack of sufficient qualified trainer, in adequacy of the training room, and shortage of computers on service, poor organization of the training center, and lack of attention on the program services by the concerned bodies.
3) Computer skill and guidance support provided to the student with visual impairment have a direct relation ship. Those students who have the skill are those who are prior guidance support to use computer technology available to PWVI.
4) There is a difference in computer literacy among female and male visually impaired students. Male students are found more computer and internet users than female students.
5) The computer literacy is also associated with education level of the respondents. Out of the computer users more than 88% are senior students.
6) There is a limited training center on assistive technology to PWVI in Addis Ababa.
7) Addis Ababa University found being a great sponsor of computer training provider to SWVI. The majority of the computer users are those students who have trained by Addis Ababa university training center.
8) The factors like cost of computer connection, limited or lack of assistive technology facility in the public service, lack of awareness, inadueqcy of training services, are found a major barriers to access to the computer and internet.

Recommendations

- The student with visual impairment should have to get up – to – date information about the new technologies invented fro them, including computer technology.
- The concerned bodies like NGo or Go that work with people with visual impairment should cooperate and play the role of awareness raising among the visually impaired students about the new technologies.
- The students with visual impairment should get computer skill because these parts of society were not able to use printed materials, unless it is translated to Braille. So, in order to get up-to date information computer skill is very important to them. To provide such computer training, the special schools for the blind NGos and charity organization, which work with people with visual impairment, should take this issue into consideration to train visually impaired students to use computer technologies efficiently.
- Addis Ababa University should be appreciated the effort it make to train the student with visual impairment on computer usage. In the future, the University should widen its training service, by hiring sufficient trainer and preparing larger training center if possible to train all visually impaired students to use computer effectively.
- The guidance and counseling offices or concerned bodies like the department of special needs education should work hard to minimize the gender difference on computer skills or literacy as manifested in Addis Ababa University.
- The NGOs, like ATCB and other who provide different training to the person with visually impairment, including computer technology training should work in cooperation with Addis Ababa University to provide computer training to SWVI.
- Computer skill is a necessity to any individuals including people with visual impairment, so the student with visual impairment should take the training by any means possible.

Reference

Abreham, Peter. (2006). Accessibility and Usability in information and communication technology: Northampshire: Bloor research.

Adaptive technology resource center (2001) technical glossary Toronto Canada, University of Toronto. Retrieved from the Worldwide Web http:// www.vtoronto.ca/atrc/reference/tech/scread.html

Adeyinka, Tella(2008) Gender differences in computer literacy among undergraduate students at the university of Botswana. Malaysian journal of library and information science, vol. 13, no. 1, july2008:59-59

Anto. Arkato (2004). The educational challenges of integrated blind student: the case of Sodo Comprehensive high school. MA Thesis unpublished AAU Library.

Baker, H.J. (1959). Introduction to exceptional children (3rd. ed). New York: the Macmillan Company

Best. A.B. (1992), Children with special needs. Teaching children's with visual impairment

Bush, Mark L. (2006) Beyond web-accessibility: barrier to ICT for disabled people. London, Aidis Trust.

Canadan national institute for the blind available at. http://www.cnib. ca /library.

Craven , J (2001) . The development of digital libraries for blind and visually impaired people. //Ariadne, available at, http://wwwArindne.ac.uk/issue 30/infla

Craven, J. (2006). Web accessibility : A review of research and initiatives paper submitted at the World Library and information Congress 72nd

IFLA General Conference and Council 20-24 august 2006, Seoul Korea

DAISY consortium: Available at, http://www.daisy .org

Dessalegne. Abebe. (2007). Educational problems of blind student: the case of Minilik II and Teklehymanot regular primary school. MA thesis unpublished, AAU library.

EICTDA(2007);ICT Accessibility Requirements study for persons with disability survey study unpublished MOE library.

Gartner Group(2000):The digital divide and American society Available at. www.garnrergroup.org Gearheart B.R, Weishahn M.W,& Gearheart, C.J. (1988). The exceptional student in the regular classroom (4th Ed), Columbus: Merrill Publishing company.

Gregory,S.(1997). The disabled self. In M. Wetherall(Ed.), Identities, group and social issues(pp.354-361).London: sage Publication

Keralem. Getaneh. (2006), Employment opportunities and challenges of the people with the visual impairment in the case of selected organization in Addis Ababa : MA. Thesis unpublished AAU library.

Kings Fund consultation (2001). Definition of the term Assistive technology. Retrieved Nov 24, 2008,from http://www.tastuk.org/about/definition of at.php

Kirsty Williamson,Steven Wright Don schauder & Amanda Bow (2001).The Internet for the blind. Monash University and school of information studies,CharlesSturtUniversity.RetrievedOct18,2008,from Jcmc.indiana.edu/vol17/issue1/Williamson html.

Hunt, P.A. (1966).Critical conditions. In T. Shakespeare (ed.). The disability reader: Social science perspective. London: Cassel.

Lawson, Anna(2005) The UN Draft on Disability convention-Turning Rights into Reality.

Lewis. A(2004):A users of the experiences of blind visually impaired people using electronic information services with regard to practical implementation of these services in public libraries . MA thesis, unpublished London University.

Makinde. O.(1990). Fundamentals of guidance and counseling. Hong Kong:

Mackmillan Education LTD.

Mohit .A (2005). ICTs in the service of persons with disability paper submitted to UNESCO

MOLSA (1996) Developmental social welfare policy of FDRE, Addis Ababa: Ministry of labour and social Affaires.

MOLSA (1999): National program of action for rehabilitation of persons with disabilities Addis Ababa , Ministry of labour and social affairs.

Mont,Daniel (2007): Measuring Disability Prevalence. Special Protection: The world bank. Retrieved Jan 25, 2009, from: world bank.org /social protection/resources/ sp-discussionpaper/disability,op/0706pdf.

Nordic development cooperation (1999), Nordic guidelines for computer accessibility Norway

Office for disability issues(ODI)(2002).Policy statement on social care: disability right commission(2002). Retrieved Mar,3, 2009 from http:/www.odi.gov.uk/working/independent-living /index.php.

Perrett, B. (1995). *Marketing considerations. In P. Roe.* (ed.), Telecommunication for all. Commission of the European Communities, Lausanne. Cited by Johnon, L. and Moxon, E.(1993). In whose service? Technology, care and disabled people: the case for a disability politics perspective. Disability and society

Quinn G. and Degener, T (2002): Human right and disability the current use and the future potential of United Nations human right instrument in contents of disability. Retrieved Sept 12, 2008, from www.ohchr .org / English / issues/ disability/study. Html

Smart (2001): Disability, society and the individual. Aspen publisher, Inc Gaithersburg, Mary land

Sisay Tamene (2007). Problems, and prospects of the education of blind student at Addis Ababa University. MA Thesis unpublished, AAU Library.

Taylor, R.L.Stenberge, L.,and Richard S.B. (1995). Exceptional, children integrating research and Teaching (2nd, ed). London; singular publishing group; Inc

Tirussew Tefera. (2005) Disability in Ethiopia: issues, insight and Implementations Addis Ababa; Addis Ababa University publishing press Tirussew Tefera. (1991) guide for services for the handicapped in Ethiopia, Addis Ababa university publishing press

Wegayehu Tebeje(2007/8) Research method in special education reading material compilation two ,college of education department of special education AAU. UN (1993), Standard Rules on the Equalization of Opportunities for PWDS. Retrieved Nov, 13, 2008 from www.independet living .orga/standard rules/standard rules 1. html. UN (2006) Convention on the Rights of persons with disabilities. Retrieved Oct 6, 2008, from http://www.un.org/esa/socdev/enable/rights/conVtexte.htm

UN Enables (2000) Information and Communication Technology and persons with disabilities Waddel,Cynthia(2003) The principle of Non- discrimination and equality from Disability perspective: Critical issues concerning Special measures and disability. Paper presented at the Ad Hoc committee on a comprehensive, international convention on protection and promotion of rights and dignity of PWDs. World Enable (2003) Manila Accessible Information and Communication technology (ICTs, Design Recommendations. Retrieved Oct 13, 2008, from World Enable (2003) http://www.worldenable.net/manila 2003 /Design Recommendations.htm

Web Accessibility initiatives. Retrieved Feb 21,2009, from http://www. W3 .org/WAI.

Appendix 1

Addis Ababa University

School of Graduate Studies

Department of Special needs Education

Semi- Structured interview guide to organizations

Introduction

I am conducting a study on hard ware and software assistive technology accessibility requirement for the students with visual impairment at Addis Ababa University.

The general objectives of the study are:-

1. To identify the problem student with visual impairment are facing in the use of computer and internet service due to their vision limitation, and to set out the opportunity, computer and internet provides to educational information need of student with visual impairment
2. To indicate what should be done to make hardware and software assistive technologies are accessible to student with visual impairment.
3. To indicate the barriers that limit student with visual impairment to use computer and internet.

To this end, this semi-structured interview is prepared to collect the required data and information from your organization.

Since your organization is engaged on providing adaptive technology training to people with visual impairment, you are kindly requested to share your experience about the issue of access of PWVI to assistive hardware and soft ware technology

Thank You

I. General Question

1. What are the objectives of your organization?
2. Is your organization, a service provider NGO, government or a private?

II. Questions related to adaptive hardware and software accessibility

3. What does adaptive hardware and software mean in the context of people with visual impairment?
4. What does accessibility mean in the context of people with visual impairment?
5. The universal design of computers can't satisfy the needs of all people, but with the use of assistive technology it can be access to people with visual impairment. What are these assistive technologies that can help PWVI to use computer and internet for their information needs?
6. The literature, states that there are many assistive technologies that can be used by PWVI to get access to computer and Internet: How many of them are available in Ethiopia. What is the experience of the other world in this regard?

III. Question related to training

7. What kind of training is given in your center?
8. Peoples with visual impairment have a range of vision ability because vision impairment is not homogeneous by it nature, so how do you train those PWVI who have different ability?
9. How long does the training take to teach them to use computers and Internet effectively?
10. How much is the cost of training to cover the full course?
11. As literature states most PWVI have a low living standard some of them cannot pay training fee how do such people get training, Is there any support given to them from your organization.

12. If the answer is yes to above questions, how many visual impaired people get such assistance?
13. Have your free service include visually impaired university student?

IV. Questions related to awareness

14. Most people do not know, whether such opportunities are exist to people with visual impairment or not so what is your effort to create awareness.
15. How much visually impaired people take such training so far?
16. Do you have a branch center in regional states? Where?
17. What is your future plan to enhance the service of such training?
18. What should be done to enable PWVI benefit from assistive technologies?

Thank you

Appendix 2

Addis Ababa University

School of Graduate Studies

Department of Special Needs Education

Questionnaires to Visually Impaired Student

Introduction

Dear Students

I am a graduate student at the Department of Special Needs Education. For the partial fulfillment of the degree of masters; I am conducting a study on accessibility of assistive hardware and software technology for the information need of people with visual impairment through internet. The general objectives of the study are:

- To identify the problems people with visual impairments (PWVIs), are facing in the use of assistive hardware and software technology.
- To develop set of feasible proposal aimed at addressing the problems and ensure access to assistive hardware and software technology.

As the study will be useful for policy makers that are working in the area of visually impaired individuals, you are selected for this study as participant. Your knowledge of the problem and experience can provide adequate information on the issue. Therefore, your unreserved cooperation in providing genuine information will be appreciated.

Thank you

Direction 1. The information you provide will be kept confidential.

2. No need of writing you name

3. Listen to the following items and provide your answer to the person who assists you in reading.

Section A

Respondent's Profile

1. Region you came from ----------
2. Age ----------
3. Sex M ☐ F ☐
4. Parental income level
   a. Better than most people ☐
   b. Similar as most people ☐
   c. Worse than most people ☐
5. How much monthly pocket money do you have? _____
6. Educational level
   a. 2nd year ☐
   b. 3rd year ☐
   c. 4th year ☐
   d. 5th year ☐
   e. MA ☐

Section B

Access to assistive technology for VI person

7. Can you use computer and internet for information needs?
   1. Yes ☐ 2. No ☐
8. . If your answer is YES to question 7, how did you use it?
   a. I used it by my self unassisted ☐
   b. I used it assisted by other persons ☐
   c. Others, please specify ----------
   ----

9. If your answer to question 8 is using the computer unassisted why do you use it unassisted and by your self alone? (you can answer more than one)

   a. It has been set up to suit my needs ☐

   b. It has additional facilities to adjust it to suit to my needs ☐

   c. I have the basics and I know how to learn on my own. ☐

   d. If other please specify ----------.

10. If the answer to question 9 is either item a, or b which of the following facilities or devices made your experience unassisted? (Your answer can be more than one).

    a. Screen magnification ☐ b. Braille Embossers ☐

    c. Computer fitted with CD-ROMs ☐ d. Screen reader ☐

11. Which of the following assistive hardware devices do you use in the library? a. Braille embosser ☐ b. large print printer ☐

    c. Refreshable Braille display ☐ d. none of them ☐

12. If your answer to Q11 is item, d, why not, please explain ----------

---

13. Which of the following assistive software do you use in the library?

    a. Braille translation ☐ b. screen magnification ☐ c. screen reader ☐

14. If the answer to question 10 includes one or more of the choices which of the following benefits have you got?

    a. Operate computer ☐

    b. Surf the internet/web ☐

    c. Access books and printed materials ☐

    d. create and deliver presentations ☐

    e. Gain access to increased opportunity ☐

    f. Others please specify ----------

    ---

15. Where did you often get computer and Internet services?

    a. At home as I own them ☐

b. Public center ☐
c. NGO founded center ☐
d. A.A.U digital library ☐
e. Your association (ENAB) center ☐
f. Private provider ☐
g. Other _____

16. If the answer to question 14 include Item b, for what purpose do you perform web search?

a. News and current information ☐
b. Educational and work related information ☐
c. E-mail communication ☐
d. Entertainment ☐
e. Others specify ----------
---

17. If the answer to question 8 is choice b, what do you think is the reason for getting assisted by other people? (More than one answer is possible)

a. Assistive equipment don't suit to my needs at all ☐
b. There are no alternative add-ons to facilitate usage ☐
c. Even if there are alternative add-ons to suit my needs, I don't have the required training ☐
d. Using volunteers is cheaper than using add-ons ☐

f. Others please specify ----------
---

18. If you don't use the computer and the internet, why didn't you use

a. I don't own as I can't afford ☐
b. There are limited or no public centers suitable for PWVI ☐
c. Private sectors service providers don't have assistive devices ☐
d. Even if there are assistive devices they are expensive to use. ☐
e. A.A.U doesn't provide such services. ☐

f. Other (please specify)----------

Access to Training

19. Have you been trained to use computer and the internet?

1. Yes ☐ 2. No ☐

20. If your answer is YES to question 19 were did you get training?

a. At A.A.U library ☐

b. At NGO center in A.A ☐

c. At ENAB center in A.A ☐

d. At special schools for the blind ☐

e. Other, place, please specify ----------

21. If your answer is 'Yes' to question 19, which of the following did your training covered? (More than one answer is possible)

a. Introduction to computer ☐

b. Word processing ☐

c. Spread sheet ☐

d. Data base management/access ☐

e. Basic internet ☐

f. Basic e-mail communication ☐

g. Others, please specify ----------

---

22. If you trained on computer, who paid for your training?

a. My self ☐

b. A.A.U ☐

c. ENAB ☐

d. NGO ☐

e. Government (specify) ----------

f. Other civil society (specify) ----------

23. If your answer is NO to Q 19 what are the factors that limit you to take training.

a. Lack of awareness ☐ b. lack of interest ☐

☐

c. Hate of technology ☐ d. Shortage of finance

e. Shortage of training center ☐ d. Time constraint ☐

f. Personal case ☐

Guidance Services and awareness

24. Before training on computer, have you got guidance support to use computer and assistive technology for your information needs?

a. Yes ☐ b. No ☐

25. If your answer is 'Yes' to question 23 who provide you guidance?

a. A.A.U library ☐

b. A.A.U Special needs education department ☐

c. Your association (ENAB) ☐

d. Friends ☐

26. Have you ever got financial or a free service support for your training on computer?

a. Yes ☐ b. No ☐

27. If yes, to Q25 who provide you such financial or free service support?

a. AAU ☐

b. NGO ☐

c. ENAB ☐

d. family ☐

28. If you are computer and internet user how often do you get assistance from librarians?

a. Always ☐

b. Some time ☐

c. Never ☐

29. Do you have awareness of using computers and internet for your information needs?

a. Yes ☐ b. No ☐

Section C Barriers to access to information need

Please indicate the extent to which you agree or disagree with the following statement, concerning barriers, in use of information to PWVI?

30. The cost of access to computers and internet connection is very high.

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

31. There is limited public assistive technology facilities access to PWVI.

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

32. PWVI lacks awareness in use of available options.

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

33. Training access on assistive technology is inadequate for PWVI.

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

34. Many web pages are inaccessible to PWVI.

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

35. The library do not provide supportive materials in accessible format

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

36.I have fear of using technology.

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

37. Information on web loaded with graphics and images are difficult to access by PWVI?

1. Agree ☐ 2. Disagree ☐ 3.neutral ☐

38. The number of trainer on AT in AAU digital library inadequate.

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

39. Digital library AAU is not sufficient to accommodate VI student.

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

40. I have time constraint to take training on computer.

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

Section D: promoting assistive technology accessibility

Indicate the extent to which you agree or disagree with the following statements concerning the effort that should be taken to promote and ensure access to ICT

41. Assistive devices should introduced for improving access of PWVI

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

42. Existing curriculum for visually impaired should contain AT training.

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

43. Visual impairment should be considered in AT research.

1. Agree ☐ 2. Disagree ☐ 3. Neutral ☐

Thank You.

Appendix 3

Addis Ababa University

School of graduate studies

Department of special needs education

Semi structured inter view questions

Respondents:-librarians

Dear

This is a research intended to study on accessibility of assistive hardware and software technology to the student with visual impairment at AAU. As you are one of those who provide such services to the student with visual impairment, you know a lot about the limitations of access of the technology to such students. Therefore, you are selected as the participant of this study. Your contribution to this research is very useful as the main objective of the study is:-

- To identify the problem student with visual impairment faces when using computer and Internet for their information needs due to their vision limitation
- To indicate the barriers that limit student with visual to use computer and Internet
- To develop set of feasible proposal aimed at addressing the problems and ensure access to assistive hardware and software technology

As the study is very useful for organizations and government bodies that work in the area of visually impaired peoples, your cooperation is highly appreciated

Thank you in advance

A GENERAL

1. What is the objective of the digital library?
2. What is the main objective of AT training centre in AAU?
3. What does accessibility of assistive hardware and Software technology mean in the context of PWVI?

ACCESSIBILITY

2.1. When do the digital libraries open in Addis Ababa University

2.2. What kind of service do the digital libraries provide to the student in general?

2.3. Do the student with visual impairment have access to the digital library?

2.4. If they have access for what purpose do they use the digital Library?

2.5. Have the assistive hardware and software technology available to visually impaired student in digital library

2.6. Which of the following assistive hardware and Software Technologies are available in AAU digital library (your answer can be more than one

a). Braille embosser

b). Braille translation software

c).CCTV (closed circuit television).

d). larger print printers

e). OCR(optical character recognition).

f). Refreshable Braille display

g). screen magnification software

h). screen reading software

2.7. If all assistive hardware and software technologies Mentioned above in Q6 are available in the library Does the student with visual impairment use all of Them for their information need?

2.8. If your answer excludes one or more item in Q6 why Note available? Please explain it?

2.9. Does the library has materials in accessible format such as digital, audio, large print and Braille formats to the student with visual impairment?

2.10. Do the Addis Ababa university library provides Adaptive technology training to the student with visual impairment?

2.11. How long does the training take?

2.12. Who coves the training fee?

2.13. To best of your knowledge what are the limitation of The Training.

2.14. Have the number of blind digital library users increased or

Decreased after the training?

2.15. Have the library of AAU create awareness among Visually Impaired students to get training and use computer and Internet?

a). if no why note? Explain it?

b). if yes, is the training sufficient to help them?

2.16. After the awareness how do the visually impaired student

Response

2.17. What are the major problems of visually impaired student to use computer and Internet?