AN INVESTIGATIVE STUDY ON AWARENESS AND USE OF ASSISTIVE TECHNOLOGIES FOR INFORMATION SUPPORT FOR DIFFERENTLY ABLED PERSONS IN KERALA

Thesis submitted to the
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in
LIBRARY AND INFORMATION SCIENCE

By

MINIMOL K.

Under the Guidance of

Dr. Jalaja V.
Associate Professor (Rtd)
Dept of Library and Information Science
University of Calicut

DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE
UNIVERSITY OF CALICUT

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UNIVERSITY OF CALICUT
DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE

Dr. JALAJA V. Mob:9847527564
Associate Professor (Rtd.)Kerala-673635

CERTIFICATE

This is to certify that, the thesis entitled **"An investigative study on awareness and use of assistive technologies for information support for differently abled persons in Kerala."** prepared by Smt. Minimol. K for the award of the degree of Doctor of Philosophy in **Library and Information Science** of the University of Calicut is a record of bonafide research work carried out under my supervision and guidance. No part of the thesis has been submitted for any degree, diploma, fellowship or other similar title or recognition by any other University.

Dr. Jalaja. V
Supervising Teacher

Dr. Mohamed Haneefa. K
Co-guide
Associate Professor & Head
Dept. of Library & Information Science
University of Calicut

University of Calicut**,**
05.08.2019

DECLARATION

I Minimol. K, do hereby declare that, this thesis entitled **"An investigative study on awareness and use of assistive technologies for information support for differently abled persons in Kerala"** is a record of independent research work carried out by me, under the supervision and guidance of Dr. Jalaja. V, Associate Professor (Rtd), Department of Library science, University of Calicut, in partial fulfilment of the requirement for the Doctor of Philosophy in Library and Information Science, University of Calicut and no part of the thesis has been presented for the award of any degree, fellowship or other similar title or recognition by any other University.

C. U Campus **Minimol. K**
05.08.2019

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ABBREVIATIONS

APP	:	Applications (Mobile App)
AT	:	Assistive Technology
DAISY	:	Digital Accessible Information System
ICT	:	Information & Communication Technology
KFB	:	Kerala Federation of Blind
KSCAT	:	Kerala State Centre for Assistive Technology
NAB	:	National Association of Blind
TDD	:	Text Teletype Devices
TTY	:	Text Telephone
MG	:	Mahatma Gandhi University

Chapter 1

INTRODUCTION

1.1 Introduction

Information is an essential element in a society for the growth anddevelopment of its individuals. So, the information is a right of every individual including differently abledpersons in our society. Rapid growth of information communication technology has paved way for providing information at the fingertips of all, whether they are normal persons or differently abled. Like normal persons, there is a growing need of information among the differently abled persons.

In our society, the differently abled persons also a major portion and as a social being, we should be responsible to provide them universally accessible and other services to enable all such users to improve their life to a maximum. Today technology has played a key role in changing the way the different users, especially the differently-abled, to access information. Now a days, electronic access, networked resources and other forms of information communication technologies (ICT) are becoming the norm for information delivery. Information can be accessible within seconds due to rapid growth and development in the field of ICT. So, technology, largely a boon to people with disabilities for accessing information within seconds and the various assistive technologies bridge the gap by providing innovative ways to help these people to access various resources. Census 2011 data revealed that

about 2.21% of population is suffering from one or other kind of disability(www.censusindia.gov.in)

1.2 Differently abled people

'Differently abled people' is the term coined by US Democratic National Committee in the early 1980, as a mere acceptable term than disabled, means the persons with any restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being. They require special aids and appliances for their daily functioning. Intergovernmental agencies, national government and non-government outfits have evolved landmark policy options through a host of specialized schemes and programs for such less fortunate with a view to ensure holistic societal development. The *Persons with Disability Act 1995* indicates that differently abled people should have access to information at all levels.

Everyday advancement of technology is a new hope for these persons and here comes the relevance of information communication technology.

Information communication technology (ICT) is an umbrella term that refers to all applications related to communication, ie, "ICT refers to the technologies that provide access to information through telecommunications.

It is similar to information technology but focus primarily on communication technologies. This includes, the internet wireless networks,

cellphones and other communicationmediums" (The tech terms computer dictionary).

1.3 The impact of ICT on differently abled persons

The advent of ICT brought so many advantages to the differently abled persons. Assistive technology is one of such products to enable them to live in a maximum potential. The Technology Related Assistance to Individuals with Disabilities Act of 1988 defined assistive technology as "any item, piece of equipment or product system, whether acquired commercially, off the shelf, modified, or customized that is used to increase or improve functional capabilities of individuals with disabilities" (NECTAC, 1988). It helps these persons to improve access and independence to a maximum level.

There are so many ACTS, Policies and guidelines to make them much forward in the society by international, national or state level. At International level, ALA, IFLA etc makes much more contribution to this field. India is not far behind. The persons with disability act 1995 provide more provision to these people India. Now it is replaced by the Rights of Persons with Disabilities Act, 2016, which provides all provisions of United Nations Convention on the Rights of Persons with Disabilities. Some of the institute which provides services to differently abled persons in India are (www.wikepedia.org);

a. National Institute for the Visually Handicapped

b. National Institute for the Hearing Handicapped.

c. National Institute for the Orthopaedically Handicapped

d. National Institute for the Mentally Handicapped

e. The Institute for the Physically handicapped.

1.4 Assistive technologies and the differently abled

There are somany assistive technology products are for these people. such as high tech, low tech and medium level technologies.

Population of the present study comprises of differently abled persons in the institutions and organisations in Kerala which are providing assistive technologies for information support for them. According to Census 2011, In India 2,68,10,557 differently abled persons and in Kerala it is 7,61,843, ie, 2.2% of the total population. (www.censusofindia.gov.in) They require special aids and appliances for their daily functioning and also to empower them to achieve their goals. There are many government levels programs and policies to empower them. As per Disability Census 2015, there are 22 categories of disabilities are reported in Kerala. To ensure educational achievements and better development prospects for them, there are so many institutions in Kerala. The study group consist of visually impaired, speech& hearing impaired and locomotor impaired persons.

According to legal definition, a visually impaired person is one if he has visual acuity of 20/200 or less in the better eye even with correction or has a field of vision so narrow that its widest diameter subtends an angular distance no greater than 20 degrees. Partially sighted are those who have visual acuity falling between 20/70 and 20/200 in the better eye with correction. (Reddy,2000)In this study, these two categories are taken for the study as visually impaired persons.

According to American Speech language Hearing association(ASHA), the persons with impairment of the articulation of speech sounds are speech impaired persons and the persons with difficulties in the perception of auditory information is called hearing impaired persons(www.asha.org). Majority of the cases these two disabilities found together, if no hearing is there, speech will be difficult. In this study, the persons with these two communication disorders are taken for the study as speech &hearingimpaired persons.

Another category of differently abled persons under study are locomotor impaired, who are those with impairment in movement, ie, a person's inability to execute distinctive activity associated with movement is called locomotor impaired persons (www.rehabcouncil.nic.in).

Various assistive technologies for visually impaired are conventional Braille books, Audio books, Daisy books (Digital Accessible Information

System) Screen reader software like JAWS, NVDA, Orca etc. Some hardware like scanner, reader, voice recorder, braille printer, braille slate, Angel player/daisy player etc are the assistive hardware for the visually impaired people. Braille is the ancient assistive technology to visually impaired persons and which is a tactile code that enables the blind to read and write with a combination of rectangular six dots. It was invented by Louis Braille in 1829 (Mates, 2011).

TTY Emulative software, Dragon Dictate (Convert speech to text). Big Mac (Picture software), Video captioning software and Skype are the main assistive software for speech and hearing impaired people. Text Telephone Device (TTY/TDY), portable speech synthesiser, alarming devices/signal system, assistive listening system, closed caption decoders and hearing aids are the main assistive hardware for speech and hearing impaired people.

Dragon naturally speaking, on screen board, voice recognition software etc are main assistive software for the locomotor impaired people. Simple / Electric wheel chairs, walking frames / Ramps, adaptive keyboards etc are main assistive hardware for the locomotor impaired people

1.5 Institutions surveyed for the study

The assistive technology providing institutions in Kerala are surveyed here for the study and they are broadly classified into Libraries, Non-

GovernmentalOrganisations(NGOs) and Special Centres. Each institution coming under that are,

I. Libraries

a. C. H. Mohammed Koya Library, Calicut University, Malappuram (Dt), Kerala

b. Mahatma Gandhi University, Kottayam (Dt), Kerala

c. Farook College, Calicut (Dt), Kerala

d. Ability College, Pulikkal, Malappuram

e. Special Schools (North, Middle, South zone of Kerala)

II. Non-Governmental Organisations (NGOs)

a. Kerala Federation of the Blind (KFB)

b. National Association of the Blind (NAB)

c. Ability Foundation

d. Jyothirgamaya Foundation

III. Special centres

a. Centre for Disability Studies (CDS) Thiruvananthapuram

b. Kerala State Centre for Assistive Technologies (KSCAT), Calicut

c. CATI-NISH, Thiruvananthapuram

I. Libraries

a. C. H. Mohammed Koya Library, Calicut University

Calicut university library established in 1971 and later renamed as C. H. Mohammed Koya Library in the honour of education minister,Kerala, has a fabulous collection of printed books, e-journals, e- books, audio books, digital library and the facility of services to differently abled, ie**, ICT centre for visually challenged**. It was set up on January 28th 2010 with the technical assistance of Kerala State IT Mission. It acquires latest technologies to assist the visually impaired community. It provides basic computer training on Keyboard familiarization, Basics of Word processing, Spread Sheet, Internet Surfing & e-mailing, CD-Writing etc. It has the provision of Daisy books and it provides resources through Sugamya Pustakalaya, new venture providing online e-library for visually impaired people created by Department of Empowerment of Persons with Disabilities, Ministry of Social Justice and Empowerment in collaboration with member organizations of Daisy Forum India (DFI) (htttps://library.uoc.ac.in).

b. Mahatma Gandhi University

Mahatma Gandhi University Library popularly known as M. G Universitylibrary was established in the year 1989, it has a provision of service to differently abled as E- lab for differently abled providing various assistive technologies to visually impaired students of it. (https://mguniversity.edu)

c. Farook College, Calicut.

Farook college is a Government aided arts and science college, located in Feroke at Calicut. Farook College has installed a Digital Talking Book Library at Abussabah library for the benefit of visually challenged students and aptly named it **Insight**. (www.farookcollege.ac.in/library). It provides various assistive technologies like screen reader software, scan and read software etc to its visually impaired students.

d. Ability College, Malappuram

It is one of the major arts and science college for speech and hearing functioning in Malappuram District. It provides training in Indian sign language and various assistive technologies to hearing impaired students. (www.abilityindia.net)

e. Special schools.

From the special school in government and aided level, and special schools in private sector, investigator randomly selected 10 assistive technology providing schools in zonal wise, northern Kerala, Middle Kerala and southern Kerala.

II Non-Governmental Organisations (NGOs)

a. Kerala Federation of the Blind (KFB)

Kerala Federation of the Blind (KFB) is a non-profit organization working for the benefit of visually challenged or print impaired people in

Kerala established in 1967. It runs entirely by the visually challenged people. They are actively engaged in providing various assistive technologies like Braille, Audio books and Daisy book production for the benefit of its users. It established the first online digital accessible library for print disabled or visually impaired with the support of Government of Kerala (www.kfbindia.org). KFB Thiruvananthapuram and Calicut are selected by the investigator for this study.

b. National Association of the Blind (NAB)

National association for the blind, Kerala is a non-profit organisation working for the benefit of blinds in Kerala. It provides various assistive technologies for the visually impaired people. NAB, Thiruvananthapuram is selected for the study. (www.nabkerala.org)

c. Ability Foundation

Ability Foundation for disabled is started functioning in Pulikkal, Malappuram District from 2012 which provides various assistive information services/technologies to visually impaired speech and hearing impaired and Locomotor impaired persons. (www.abilityindia.net)

d. Jyothirgamaya Foundation

Jyothirgamaya Foundation is a non government organisation functioning inThiruvananthapuram for the empowerment of persons with

visual impairment from 2015 onwards. It provides various assistive technologies to visually impaired people. (www.jyothirgamayaindia.org)

II. Special centres

a. Centre for Disability Studies (CDS) Thiruvananthapuram

The Centre for Disability Studies, which is an organisation concentrated on innovations in Rehabilitation technology is established in Thiruvananthapuram as part of LBS Centre for Science & Technology. It undertakes academic, research, training and extension activities in order to empower differently abled persons in Kerala. It focusses on research and development of newer educational technologies for Visually impaired, physically impaired and hearing impaired, establishing resource and information centres relating to disability studies and provides all information supports to social inclusion activities pertaining to differently abled (www.cdskerala.org).

b. Kerala State Centre for Assistive Technologies (KSCAT), Calicut

It is functioning under Kerala State Council for Science Technology and Environment (KSCSTE). As it is functioning in Farook College Calicut, a memorandum was signed between KSCAT and Principal, Farook College to have mutual cooperation in providing computer training for visually impaired candidates. IT started functioning with the objective of making visually impaired students fit for competitive examinations, enhancing their English

and also for extracurricular activities and mobility by providing appropriate assistive technologies. (www.kscat.kerala.gov.in)

c. CATI-NISH, Thiruvananthapuram

The Centre for Assistive Technology and Innovation (CATI) at National Institute for Speech & Hearing, Thiruvananthapuram is established to meet the assistive technology needs of differently abled persons, especially their needs for mobility, communication, education, integration, employment, socialisation, leisure and creation for their students and clients of NISH (www.nish.ac.in).

1.6 Need and significance of the study

The rapid development in the field of information communication technology, makes the capabilities of the people to a certain extent, the differently abled persons are also be benefited from it. In earlier days, there are only conventional technologies like Braille books only, but now the most advanced screen reader software like assistive technologies are there to make their life so easier. In this scenario, a study on awareness and use of assistive technologies for these people for information support is a relevant one in Kerala.

1.7 Statement of the problem

The advancement of information technology put forward so many gadgets to these differently abled persons. The problem of research is how

these differently abled persons are aware of such assistive technologies and use it for their information support, i.e;the problem of the present study is entitled as the ***'An investigative study on awareness and use of assistive technologies for information support for differently abled persons in Kerala.'***

1. 8 Operational Definition of key terms

The key terms of the problem are

1. Awareness
2. Use
3. Assistive technologies
4. Information support
5. Differently abled
6. Persons

Awareness

In Encarta Thesaurus (2001), awareness means ''knowledge, understanding, grasp, appreciation., familiarity, recognition etc.''

In this study, awareness means the differently abled person's knowledge of various assistive technologies provided by the institutions for their information support.

Use

The New Oxford Thesaurus of English (2000), defines use as 'to take advantage of''

Here in this study, use means the condition of being used and usefulness of various assistive technologies by the differently abled persons for their information support.

Assistive technologies

The Encarta Thesaurus (2001) gives the definition of assistive as an "aid, help, tend a hand etc."

According to Online Collins Dictionarytechnology refers to "methods, systems, and devices which are the results of scientific knowledge being used for practical purposes."

According to Wikipedia, assistive technology is an umbrella term that includes assistive, adaptive and rehabilitative devices for people with disabilities.

For this study, assistive technologies mean various assistive devices and services for the smooth functioning of differently abled persons and for their information support.

Information Support

According to ALA Glossary of library and information science information is defined as "all ideas, facts and imaginative works of the mind, that have been communicated, recorded, published and /or distributed formally or informally in any format"

As per online Cambridge dictionary, support means "to agree with and give encouragement to someone or something."

In the present study 'information support' refers to the process of providing information for the overall development of differently abled persons by using various assistive technologies.

Differently abled

The Webster's third new international dictionary of the English language (1976) defines differently as 'in a different way or manner'.

The World Book Dictionary (1981), defines able as 'having more power, skill or talent to do something, capable etc.'

In this study, differently abled is used as the more appropriate term for the disabled, now a days this is the most appropriate term than the disabled, which means the persons with any restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being. They require special aids and appliances for their daily functioning.

Persons

The Illustrated oxford dictionary (2006), provides the meaning of person as 'an individual or human being'.

Here in this study, persons are those categories of differently abled persons under study such as visually impaired, speech & hearing and locomotor impaired persons.

1.9 Objectives of the study

The major objectives assumed for the present study as follows,

i. To find out the level of use of ICT based information resources among the differently abled persons in Kerala.

ii. To know whether differently abled persons are aware and use of various assistive technologies for their information support.

iii. To find out the level of use of assistive technologies by the differently abled persons.

iv. To find out the commonly used effective assistive technology for the differently abled users.

v. To identify the level of satisfaction on the assistive technologies provided to the differently abled.

vi. To identify the barriers to access assistive technology provided for the differently abled persons.

vii. To suggest measures to improve the availability and accessibility of assistive technologies for the differently abled.

viii. To put forward a proposal for assistive information centre for differently abled in Kerala.

1.10 Hypotheses of the study

There is no significant difference in the level of knowledge about ICT based tools /services/activities among the differently abled persons in Kerala.

1. Most of the differently abled persons are aware and use available assistive technologies in their field.

2. Use of assistive technologies is moderate level among the differently abled persons.

3. Differently abled persons are highly satisfied with the assistive technologies available for information support.

4. There is a significant difference in the satisfaction level in the use of assistive technologies among the differently abled persons in Kerala.

1.11 Scope and limitation of the study

As per the Disability Census 2015, Kerala, 22 types of differently abled persons are there. But this study is confined due to the time limit the physically disabled people such as, visually impaired, speech & hearing impaired and locomotor impaired persons only, as they are forefront in approaching various institutions for their information growth.

1.12 Organisation of theses

The theses is presented in five chapters as;

Chapter 1. Introduction

The introductory chapter gives a brief sketch on ICT, differently abled people, assistive technologies, institutions surveyed for the study, Statement of the problem, need and significance of the study, objectives of the study, hypotheses of the study, scope and limitations of the study and organisation of the theses.

Chapter 2. Review of Literature.

It contains most relevant studies related to the topic and arranged in the following subheading as;

1. Information services to the differently abled persons in general.
2. Information services to the visually impaired people.
3. Information services to the speech & hearing impaired people.
4. Information services to the locomotor impaired people.

Chapter 3. Research Methodology

It contains the methodology undertaken for this research study, which includes the types of data, sampling methods, tools for data collection, variables of the study, statistical techniques used for the execution of study.

Chapter 4. Analysis and interpretations

This chapter presents the analysis of data and their interpretations collected by the investigator from the institutions under study through the questionnaire and interview schedule.

Chapter 5. Findings and conclusion

This is the final chapter of the research report. It gives findings on the basis of analysis and interpretations, suggestions for further research related with the topic of this study and conclusion.

Bibliography

References are provided at the end of the theses in APA style

Appendices

It comprises of questionnaires distributed for data collection, interview schedule, flow chart of institutions surveyed, list of special schools and types of assistive technologies for differently abled persons under study.

List of Publications

Publications emerged out of the research is attached.

1.13 Conclusion

As the information technology has it is own dimension on every individual's life, by it, much more benefited by the differently abled persons. So, the outcome of ICT, ie, assistive technology is the core part in this study and how it supports the differently abled persons information needs is analysed here.

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2.1. Introduction

A researcher must know about what has done early in the area of his/her research topic in order to get a background knowledge about the research problem. It also helps to determine the appropriate methodology of research such as sampling, data collection tool and techniques of analysis (Krishnaswami and Ranganatham, 2006). Review of related literature is an important aspect of research and it is an attempt to identify, locate and evaluate completed research reports, articles, books and other relevant studies related to the research topic. It gives a direction to the work, ie, what the researcher to be done in the topic of research. In this chapter, an attempt is made to review important studies on information services to differently abled people with a view to justify the need and relevance of the present study. For this, researcher has done intensive search through various information sources and the reviews have been taken from printed journals, online journals (from various databases available through UGC-infonet consortium), internet, conference proceedings etc.

The review of the related studies has been grouped as following subheadings such as: -

1. Information services to the differently abled persons in general.
2. Information services to the visually impaired people.
3. Information services to the speech & hearing impaired people.

4. Information services to the locomotor impaired people.

2.2 Information services to the differently abled persons in general.

Information services are very essential to the progress of citizens in our society. For the differently abled people, it is of extreme importance for the upliftment of them in the society. Information service refers to providing of information in anticipation to whoever wanted it. (Krishan Kumar 1998).

Bhyrappa and sarasvathy (2016) carried out a study on library facilities and services for physically challenged persons in the academic libraries of Mysore District. The study analysed the perception of uses about the library services and examined the services rendered to these people. The study revealed that majority of the respondents visit the library for academic purposes. 'Book borrowing facility' is preferred by the majority of the respondents. Reference service and reading facility are next most used services among the respondents. JAWS and DASBURG are the most preferred assistive technology by majority of them. The sign language for the hearing impaired students is one of the prime services followed by Braille translation and Help from staff or co-operation.

Chaputula and Mahapulanga (2016) conducted a study about the provision of library services to people with disabilities in Malawi. It highlighted the lack of library and information services to disabled people and acknowledged possible barriers. It also revealed the lack of equipment to

support the disabled users. The study again pointed out that majority of the libraries do not offer specialized training such as induction sessions. So, they recommend that equipment for the persons with disabilities should be provided and those libraries should take necessary steps to address accessibility challenges faced by those people when using the libraries.

Solanki and Mandaliya (2016), in their study, discussed about the existing scenarios of the library services for the differently abled students in some university libraries in India. They opined that academic library services for the differently abled persons are inadequate and only recently some university libraries have taken steps in this regard. It also discussed about the UNESCO and IFLA guidelines to provide the equal library services to all including differently abled persons. It also discussed about the guidelines issued by Government of India and UGC. It also highlights the special equipment, infra structure and services that the libraries should provide for the differently abled persons. They detailed the library service to be given to those persons with the outcome of advanced ICT tools such as various assistive software and hardware for each category, with a suggestion of procurement of all those ICT tools for providing smooth service to these persons.

A study by Falloon, Kerry(2015), present best practices in providing inclusive resources and services offered to persons with disabilities at a public university library, in New York. It present past and current practices of the

College of Saten Island Library, ie, about the assistive technology workstation—how it works, how many equipment are there etc, about sensitivity training, workshop for students etc, in detail. It also revealed that the future procurement of resources and services need to be tested for ADA compliance (American Disability Act). It also make conscious effort to make its home page and ancillary pages are fully accessible.

Sanaman and Kumar (2014) studied about the status of various assistive technology facilities available for the people with disabilities in National Capital Region Libraries, India. They adopted survey methodology to collect data with the help of questionnaire from various institutions /libraries serving the people with disabilities. A total of 15 libraries was selected for the study as there were many libraries not having sufficient assistive technology facilities to serve the differently abled people. The study also analysed whether these libraries are keeps them updated with the latest technological advancements taking place in the area of disability and found it to be very important to keep them updated.

Bhattacharya and Roy (2013) in their study seek the best as well as the easiest and most fruitful way of providing reference to people with

disabilities by incorporating internet technology in the form of digital reference service. It portrays Google's assistive technology possibilities like Chrome Vox, Voice typing etc. The study also revealed that libraries and information centres should frame policies and should disburse a particular amount from budget for the procurement of assistive technology along with e-books such as DAISY etc and also described about how digital reference service should carried out to the people with mobility impairment, hearing impairment, autism and developmental disabilities and to older people and children also.

Ekwelem, V.O (2013), studied about the use of electronic resources by disable library users in South east Nigeria. 194 disabled library users participated in the study. The findings showed that the only electronic resources available to the visually impaired are taped books and OPAC. It was also revealed that the information sources for mobility challenged were also not available for any of the universities under study. Findings of the study also revealed that cost of buying and equipping electronic resources for disabled users were mentioned as constraints. It also recommend that these people also should be included in the system design and that will facilitate universal accessibility.

Lewis (2013), in his study 'information equality for individuals with disabilities' discusses the challenges faced by both library users and staff in

providing information to this community. It also explained about there is a greater demand from individuals given an aging population and the technological advances that makes equal services possible. It also mentioned that they cannot consider themselves as information professionals until they understand this community, their needs and how they provide for those needs.

Majinge and Stilwell (2013) in their study examined the provision for library services to the people with visual impairments and in wheelchairs in academic libraries in Tanzania. They studied about the information sources available and the layout of library buildings in five universities in Tanzania. The findings of their study revealed that academic libraries provided services to people with visually impaired and in wheel chairs but these services are not inclusive or universal. So, they recommend to provide inclusive services to all users including people with disabilities. They also suggested to formulate policies for providing these inclusive services to these people.

Cassner, Maxey-Harris and Anaya(2011) in their study,made a comparison between academic library websites for the differently able. It analysed the service provided to the differently abled, ie, whether they are able to locate information easily from the library homepage etc. The study comprised selected member libraries of Association of Research Libraries (ARL). The findings of the study indicate that a large majority of the ARL libraries have webpage for differently abled. It also revealed that; it contains

information related to assistive technologies. It also indicates that American Library Association to review its library services for people with disabilities policy document to see whether changes or additions should be considered.

A study by Copeland (2011) analyse the library services and accessibility in public, schools and academic libraries from the perspective of differently abled. In his study, five individuals each of whom has a unique experience with disability and society, participated in in-depth interviews. The study revealed that while library accessibility has improved over the past several decades, necessary improvements still are needed. Despite the participants are facing challenges with inaccessibility, those study participants have deep love for libraries (reading).

Roberts and Smith (2010**)** Provides basic information on various types of differently abled persons and policies, services and programmes in libraries for these persons, which other libraries can adopt to serve these types of library users.

Denies-Jones (2007) outlinesvarious techniques and strategies for improving the library services for differently abled. It also highlights the tools used to improve the services in various libraries.

2.3. Information services to the visually impaired people.

Khan and Ali (2019) conducted a survey of 87 visually impaired users of different institutional libraries of Mysore (Dt.) and analysed the familiarity and use of various assistive technologies, whether training needed or not, problems face by them etc in detail. Majority of them using SARA (Scanning and Recording Appliances) and Refreshable Braille display in the case of hardware whereas JAWS, NVDA and Kurzweil in the case of software respectively in a high range. The study also revealed that majority of them responded about the need of training in the use of assistive technologies. They also responded that lack of knowledge and skill among staff are the major problem faced by them. The study also gives a brief description of various assistive hardware and software for the differently abled persons.

Bhardwaj (2018) studied about the information access mechanism for visually impaired students in select universities in Delhi. The study has analysed the availability of information communication technology (ICT) infrastructure in five major universities, problems faced by the library professionals in providing information resources to the visually impaired students, the information services provided and the requirements of libraries in developing online information system for the visually impaired users. Questionnaire method was used to collect data. The study revealed that facilities for visually impaired students in higher educational institutions are

very basic and do not have the infrastructure to satisfy their information needs. It also explained lack of funds and trained staff in university libraries in Delhi for providing assistive information support to these visually impaired students. It was also observed that library professionals also faced problems to providing services to visually impaired students because of lack of suitable assistive technologies for them.

In a study by Bateman et al (2017), they explained about the user centred design and analysis of an electrostatic touch screen system for displaying graphical information to the visually impaired users. In this study, interview method was used and focussed on identifying the technological needs of students with visual impairments and their educators. Feedback from users and experts among visually impaired community were considered for the development of this system. The study also suggested that libraries should procure assistive technologies after testing with users with print disabilities.

A study by Minimol and Jalaja (2017) on Daisy books enumerates the features, benefit and the nature and purpose of use by the visually impaired users of CHMK Library, University of Calicut, Kerala. For this study twenty four visually impaired users were interviewed. Majority of them were student's category and regular visitors of it. Majority of them opined about the assistance from the staff is a must for them and in it they also explained

that majority of the visually impaired users mainly visits the centre to read Daisy books on subjects.

Anis, Rubina (2015) highlighted in her study, the usage of electronic information services in the visually impaired libraries , assistive technologies for the visually impaired and blind people from the state of the art to future trends presents an insight into the current state of assistive technology for these people with an emphasis on what can be learnt from the last two decades of published research and what the future trends are. They performed an objective statistical survey based on information analysis of database of research publications in this field and revealed that there has been a sustainable growth in the field of assistive technology for the visually impaired from 1990's to till date.

Lundh and Johnson (2015**),** in their study, 'the use of digital talking books by people with print disabilities: a literature review' analysing the use of digital talking books, ie, (Digital Acessible Information System), DAISY books and the possibilities and the limitations of those users when using these books. It also points out the navigating features of DAISY books seem to provide unprecedented affordances in terms of user's approach to reading.

Midhula and Sudhier (2015), studied about the usage of internet resources by the visually impaired students in Thiruvaanthapuram (Dt). The study was conducted among the 74 school students and assessed that about

60% of students were computer literate and aware of online resources, assistive technologies etc. They also point out that all the students were in urgent need of proper training in order to access the information resources for them.

A study by Adetoro, Niran (2014), to assess the provision of information materials in alternative formats, and its availability, access and use of it by the visually impaired in the public libraries in the South Western Nigeria, revealed that the provision of information resources are in adequate there. He also studied about the availability of e-resources, but it is also un available. The major findings of the study is that the conventional information resources 'Braille' is the most commonly used information material there.

In a study by Haneefa and Syamili(2014) about the use of ICT by the visually impaired students of Calicut University, Kerala, revealed that most of the students under study were computer literates and are of frequent users of mobile phones.They also opined that majority of the students responded that they must need training in using the internet effectively.

Oppenheim (2013), in his study described a novel interface system to help visually impaired people to become proficient with operating unfamiliar devices. Touch sensors embedded with audio tags helps visually impaired users to use the complex devices very convenient. It also explained how these

assistive devices were enhanced with the new technology and was found very beneficial to these visually impaired people.

Pillai, Priya R (2013) gives a detailed sketch of library and information services for the visually impaired in India. In the study she visited, NIVH, twenty four university libraries, six state central libraries and seven NGOs and from these institutions, 83 respondents were participated in the study and the study provides various facilities and services, specialised services, information resources, specialized information materials etc provided by these institutions for these visually impaired students.

Yoon and Kim (2011), in their study suggested the strategy for a national development plan, role models for production and distribution of the alternative materials for the equitable library services for Koreans with print disabilities. It discusses the development plan in terms of protecting access to information, eliminating the knowledge and information gap, the role of libraries and their social responsibilities and the inadequacy of materials currently available**.**

Angadi and Koganuramath (2009), studied about the state-of-the-art facilities and services available at M.K. Tata Memorial Learning Centre. In their study, they described about the concept of disability, services and facilities of learning resource centre, library services for the visually impaired persons etc, in detail.

Koganuramath and Chaukimath (2009), in their study about the learning resource centre (LRC) for the visually impaired students in the universities, revealed the views and concerns about achieving the goals of inclusive education in the higher educational institutions, by providing all the related assistive technologies to these people through this learning resource centre.

An investigation in to the accessibility for the disabled people to the built environment by Baris and Uslu (2009) covers the problem and priorities with respect to participating to urban life of visually impaired and walking impaired people. The evaluation of this study provides information relevant to the problems, that the disabled people face with respect to accessibility to the built environment and participating to social life etc. The findings of the study revealed that the disabled people face many physical barriers in accessing the built environment. The barrier existing in the urban environment, limit the independent movement of them and this hinders the disabled people's social communication and they feel excluded. In this study Baris and Uslu expected that the results of this study will be contributed to the development of social consciousness among the disabled people.

Brazier and Owen (2000) in their study analysed the provisions of library services for the visually impaired in UK and Canada. They explained that National Library for the Blind in UK historically focussed on braille

lending but its new objective is to provide access to a range of direct and indirect library and information services by exploring the benefits of new techniques in collaboration with other organizations. Library services for visually impaired Canadians are provided by the Library of Canadian National Institute for the Blind by innovative digital services programmes and partnership programmes. In 1999, the National Library of Blind and Canadian National Library agreed to work together on a pilot project to improve services to its users using new technologies .It has revealed some problem such as copyright and production standards but the benefits to date have encouraged the two libraries to continue to work together to test the model of global library development and provide various information services to its users.

2.4. Information services to the Speech & Hearing impaired People.

Saar and Arthur-Oker (2013) in their study about reference service for the deaf and hard of hearing, surveyed the student's use, awareness and comfort level with the library and its resources. The survey included small focus groups comprised of volunteer deaf and hard of hearing students in the Deaf Studies and Deaf Education Programme at Lamar University, Texas. In short, the purpose of this study was to determine how well the library was meeting the needs of these students by exchanging the student's library use, awareness of services and overall comfort level with libraries.The findings of

this study reveal that a variety of communication options should be available there and librarians need to establish the effective ways of communication to satisfy these patrons. They should also aware of library service relevant to the disabled people's needs.

Mobus, Lisa (2010) studied about how the websites should be accessible for the deaf through sign language interpretation. The study also points out that the deaf people should provide a barrier free access to the internet through sign language video or with human interpreters. It also highlights the special needs of deaf community. It also points out that web accessibility guidelines should consider the need of deaf people while designing websites for them.

A study by Van Gils, Vanden Bogaerde and de Lange (2010) describes about the usage of modern information and communication systems and technology in two multilingual and deaf/hearing teams in an educational and research environment. They studied about the usage of information communication systems and how job demands and job control contribute to the feeling of stress among these hearing-impaired persons. This study reveals that most information is received by all in written Dutch and through the intranet and e-mail and these deaf employees predominantly rely on each other for informal information.

Alaxandar (2005) detailed about in a study how libraries accommodate patrons with disabilities. It also provides various resources, websites, organisational accomplishments, adequate teaching learning about the Americans with Disabilities Act (ADA) etc to provide a good information services to the disabled persons in America. According to this study, each LIS professional should have a good understanding about how to provide information sources to the disabled people. The study also points out that having a solid awareness and foundation of knowledge about the disabled people is a must to provide good and efficient services to them.

Edwards (1990) investigated the ways in which computer technology can enable people with a hearing and speech impairment to communicate. These range from telecommunication devices for the deaf (TDDs) to software designed to teach deaf children how to read and write in English (often their second language). It also describes about the software that converts English into American sign language vocabulary and under development is a system which will facilitate communication between a hearing person and a person with a combination of hearing /visual or hearing or speech impairment.

2.5. Information services to the locomotor impaired people.

In a study Bodaghi and Zainab (2013) expressed the views of architects and physically disabled users on the accessibility of fourteen public and university library buildings in Iran. The responses about ramps, interior

layout, exclusive space and public space for the disabled, parking obtained on the basis of a checklist constructed on the basis of American Disability Act and IFLA and institutions checklist for libraries for the disabled. The results indicate that opinions of both the respondents on all the criteria are similar except on the ramps and the interior lay out for the disabled in library buildings. Architects responded that 53.8% of libraries did not provide ramps and 63% had no exclusive space for the disabled. Frequent visitors among the disabled users rated higher on library accessibility. It also mentioned about the provision of access and equipment met minimum compliant standards on the standard checklist, but there is room for improvements.

Physically challenged students of eight institutions in Ogun State, Nigeria were selected for the study by Lawal-Solarin(2012), in order to assess the library and information services to the physically challenged students. Responses regarding the access to information resources, availability of information sources in the institutions, barriers etc encountered and the responses regarding the accessibility of information resources are poor. The study revealed the response about usage also and the most important services needed by the respondents are 'internet' and many problems are also encountered by them.

Wright, Keight C (1981), in a study focussed on the impact of legislation on the library education in order to provide proper services to

physically handicapped persons , ie, it strictly give emphasis to the modification to the library curriculum, content, media formats and other access mechanism to provide services to the handicapped. The study also give emphasis to the American Library Associations statement also on providing employment opportunities to the handicapped in libraries. The main emphasis of this study is to provide all possible information resources and services to the physically handicapped persons without any hindrance.

2.6 Conclusion

The relevant studies related with the topic of research were analysed in this chapter. The selected studies were related with the information service or library services to the differently abled in general, for the visually impaired persons, for the speech and hearing impaired persons and locomotor impaired persons. Majority among those studies were conducted by using primary data. Thorough analysis of these related studies reveal that all the differently abled persons are need of information and almost institutions are providing assistive technologies for their information support.

Thus, the literature review revealed that a study in the context of assistive technology for differently abled is important and needed. It also indicates that there is only limited information is available related to assistive technologies for differently abled persons in Indian context. As Kerala is one

among the most literate state and passing disability acts, this study is so relevant in this area.

Critical analysis of these related studies helped the investigator to finalize the objectives and the hypotheses of the present study. During the review of related literature, the investigator could not come across any worthwhile study on the awareness and use of assistive technologies for information support for differently abled persons in Kerala. So, it is hoped that this study will prove to be a valuable contribution in the assistive technology field for differently abled persons in Kerala.

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3.1 Introduction

Research methodology is a way to systematically solve the research problem. It is a representation of various steps adopted by a researcher in studying his research problem along with the logic behind them ie; it may be understood as a science of studying how research is done scientifically (Kothari, 2004). The quality of research depends on tools and techniques used for data collection and analysis.

The present study is an investigation into the awareness and use of assistive technologies for information support for differently abled persons in Kerala. The research design of this study is presented in this chapter.

3.2 Research Design

Research design is the conceptual strictures within which research is conducted. It constitutes the blueprint for the collection, measurement and analysis of data (Kothari, 2004). The methodology adopted for this study has been organised under the following sub headings.

1. Variables used for the study
2. Sampling design
3. breakup of sample
4. Data types, collection methods and tools used for the study
5. Scaling techniques used

6. Statistical techniques used for analysis

7. Consolidation of data

8. Citation style used

3.2.1 Variables used for the study

Variable is a concept which can take on different quantitative values in different situations. Two types of variable are used in this study. They are independent (Classificatory) variable and dependent (Study) variable.

- **Independent Variables**

Independent variable is a variable that are using to predict a dependent variable in a statistical analysis. On the basis of the nature of the study, the following independent or classificatory variables have been selected.

- Category of the users (Disability wise)
- Status (type of users)
- Institutions

In this study, the baseline independent variables selected for the study are category of the users, status and institutions.

- **Category of Users (Disability wise)**

Differently abled persons are those persons with any restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being. They need very specialised services to fulfil their informational and educational needs by providing suitable assistive technologies. The core user groups who are depending for assistive technology for information support according to disability wise are Visually impaired, Speech & hearing impaired and Locomotor impaired persons. Therefore, these three categories are made to represent the category of the users.

- **Dependant Variables**

A variable that are trying to predict independent variable in a statistical analysis is dependent variable i.e. if one variable depends upon or is a consequence of the other variable is termed as dependent variable. The following are the dependent variables (Study variables) used in this study.

- Facilities and services provided in the institutions.
- Computer literacy and ICT skills
- Availability of assistive technologies for information support
- Awareness of assistive technologies for information support
- Use of different assistive technologies for information support

- Familiarity of mobile Apps for information support.
- Use of different mobile Apps for information support
- Satisfaction level towards assistive technologies.
- Barriers to the use of assistive technologies.

3.2.2 Sampling Design

- **Population of the Present study**

Differently abled persons are inevitable part of our society. Population of the present study comprises of differently abled persons in the institutions and organisations in Kerala which are providing assistive technologies for information support for them. According to Census 2011, In India 2,68,10,557 differently abled persons and in Kerala it is 7,61,843, i.e., 2.2% of the total population. (www.censusofindia.gov.in) They require special aids and appliances for their daily functioning and also to empower them to achieve their goals. There are many government levels programs and policies to empower them. As per Disability Census 2015, there are 22 categories of disabilities are reported in Kerala. To ensure educational achievements and better development prospects for them, there are so many institutions in Kerala. In a pilot study, researcher observed that prominent among those institutions are for Visually Impaired, Speech &Hearing and Locomotor disabled persons, and so these categories are taken as prominent user groups

for this study. Institutions for other categories are also in Kerala but these categories do not come forward for their informational needs and educational achievements and in pilot study, it is found that the selected categories for this study, i.e., Visually impaired persons, Speech & Hearing persons and Locomotor impaired persons are working in multinational companies , schools and other institutions and they are the effective users of assistive technologies for their information support.

The prominent institutions providing assistive technologies for the differently abled persons and the population distribution is represented in Table.1.

Table 1

Population Distribution

Institutions /organisations	Categories	Approximate population	Total	Aggregate
Libraries	a. Visually Impaired b. Speech & Hearing Impaired c. Locomotor Impaired	210 108 55	373	
NGOs	a. Visually Impaired b. Speech & Hearing Impaired c. Locomotor Impaired	250 150 45	445	1098
Special Centres	a. Visually Impaired b. Speech & Hearing Impaired c. Locomotor Impaired	150 95 35	280	

- **Sampling techniques and sample size**

Population of the study comprises the differently abled persons in Kerala. From the above population, investigator selected a representative sample for the study. i.e., stratified random sampling technique is used to ensure representation of all categories of users from the institutions/organisations providing assistive technologies for them. For the present study, sample is taken from the prominent institutions/organisations which provides assistive technologies are

a. Libraries

Differently abled persons are comparatively smaller than normal library users. So, the below mentioned three groups are taken together to form a representative one.

- University libraries

There are 14 universities in Kerala. But only two universities are providing assistive technologies for these persons for their information support. They are University of Calicut and Mahatma Gandhi University and so the differently abled users from these two university libraries are taken for the study.

- College libraries

From among the different college libraries in Kerala such as Government college libraries, aided college libraries and private college libraries, only two few of them providing assistive technologies for these persons and those selected for the study.

- Special school libraries

From the special school in government and aided level, and special schools in private sector, investigator randomly selected 10 assistive technology providing schools in zonal wise, northern Kerala, Middle Kerala and southern Kerala.

b. Non-governmental organisations

Non-governmental organisations are those organizations that is not at all a direct division of any national or state government. These are with voluntary nature and are functioning with specific mission such as social welfare or social development. (https://ngosindia.com) In Kerala, Non-governmental organization has taken a step further ahead by providing services to differently abled persons. In Kerala, National Association for Blind (NAB) Trivandrum, Alappuzha, Ernakulam, Palakkad, Wayanad. Kerala Federation of Blind (KFB) (in 14 districts), Ability Foundation, Pulikkal, Malappuram (Dt), etc are the prominent institutions providing

assistive technologies for the differently abled persons. So, the investigator randomly selected from these institutions for the study ie, National Association for Blind, Thiruvananthapuram, Kerala Federation of the Blind, Thiruvananthapuram and Calicut, Ability foundation, Malappuram (Dt) have been taken for the study.

c. Special centres for these differently abled persons.

There are some special centres also functioning with government funding providing assistive technologies for the differently abled persons in Kerala. So, the investigator selected users from these institutions randomly. The prominent among them are

a. Centre for Disability Studies (CDS) Thiruvananthapuram

The Centre for Disability Studies, which is an organisation concentrated on innovations in Rehabilitation technology is established in Thiruvananthapuram as part of LBS Centre for Science & Technology. It undertakes academic, research, training and extension activities in order to empower differently abled persons in Kerala. It focusses on research and development of newer educational technologies for Visually impaired, physically impaired and hearing impaired, establishing resource and information centres relating to disability studies and provides all information supports to social inclusion activities pertaining to differently abled (www.cdskerala.org).

b. Centre for Assistive technology and innovation (CATI) at NISH, Thiruvananthapuram

The Centre for Assistive Technology and Innovation (CATI) at National Institute for Speech & Hearing, Thiruvananthapuram is established to meet the assistive technology needs of differently abled persons, especially their needs for mobility, communication, education, integration, employment, socialisation, leisure and creation for their students and clients of NISH (www.nish.ac.in).

c. Kerala State Centre for Assistive Technologies (KSCAT), Calicut

It is functioning under Kerala State Council for Science Technology and Environment (KSCSTE). As it is functioning in Farook College Calicut, a memorandum was signed between KSCAT and Principal, Farook College to have mutual cooperation in providing computer training for visually impaired candidates. IT started functioning with the objective of making visually impaired students fit for competitive examinations, enhancing their English and also for extracurricular activities and mobility by providing appropriate assistive technologies.

As the target users are differently abled persons, with the help of their teachers/instructors and also by personal observations, investigator filled up the questionnaire especially in the case of visually impaired persons. But the Speech & Hearing impaired and Locomotor impaired persons are tried their

level best to fill up the questionnaire with the help of their parents, teachers and instructors. A total of 600 questionnaires distributed giving equal weightage to each institution.

- **Sample size selection**

The investigator used the sample formulae of Creative Research System of American Marketing Association (http://www.surveysystem.com) for the selection of sample size.

$$SS = \frac{Z^2 * p * (1-p)}{C^2}$$

Z = Z value (eg. 1.96 for 95% confidence level)

p = percentage picking a choice, expressed as decimal (0.5 used for sample size needed)

C = confidence interval expressed as decimal (eg. 0.04= ± 4)

Applying this formula, the minimum sample size needed for the study is 285 in 95 % confidence level and confidence interval 5. Hence 465 samples received out of 600 selected sample for the study is enough and accurate for getting valid inferences and generalizations. From the Below diagram it is evident that the number of questionnaires distributed and received back. Hence the 465 questionnaires with fully filled questions were selected as the baseline sample for this study.

- **Breakup of Sample**

Gender wise distribution of sample.

Distribution of sample based on gender is presented in the table 2 and figure 1.

Table 2

Gender wise distribution of sample

Gender	Frequency	Percentage
Male	311	66.88
Female	154	33.12
Total	**465**	**100**

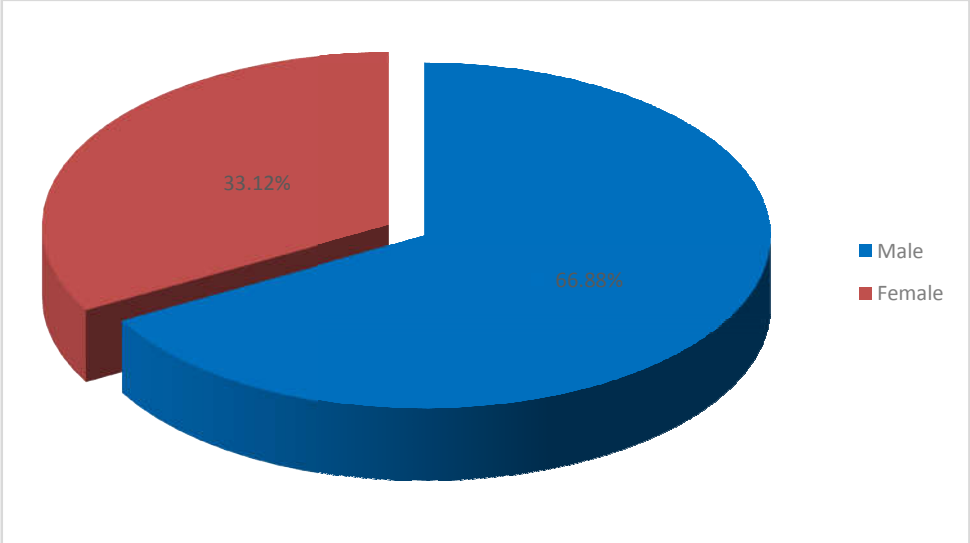

Figure.1 Gender wise distribution of sample

It is clear from the table 2 and figure 1 that 66.88% respondents are male and 33.12% are female respondents. Thus, it can be inferred that the

male representation in the institution under study are more in number than females.

Age wise distribution of sample

Age wise distribution of the sample selected for the study is given in table.3 and figure 2.

Table 3

Age wise distribution of sample

Age group	Frequency	Percentage
11-20	85	18.28
21-30	300	64.52
31-40	71	15.27
Above 40	9	1.94
TOTAL	**465**	**100**

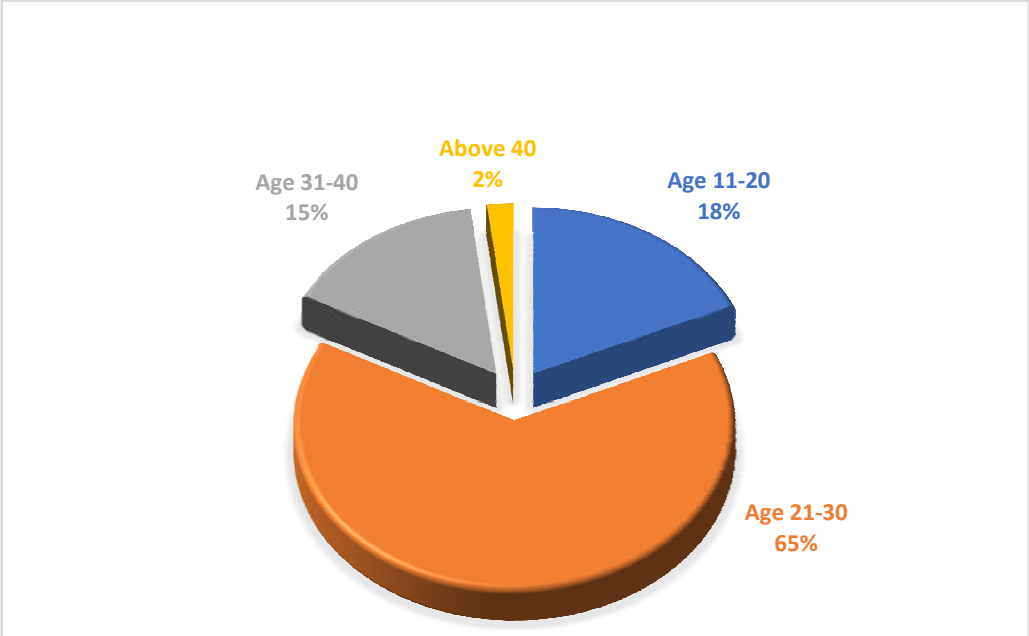

Figure.2 Age wise distribution of sample

From the table 3 and figure 2 it is evident that majority of the respondents belongs to the youngsters (21-30 yrs.) with a representation of 64.52%, followed by the age group (11-20 yrs) with the representation of 18.28%, the middle aged group (31-40 yrs) having a representation of 15.27% and the elder respondents, ie, age group above 40 yrs, represents only 1.94%.

Institution wise distribution of the sample

Table 4

Institution wise distribution of sample

Institutions	Category			Sample total	Percentage
	Visually impaired	Speech & hearing impaired	Locomotor impaired		
Libraries	70	69	16	155	33.33
Non-Governmental Organisations (NGOs)	90	35	30	155	33.33
Special Centres	75	40	40	155	33.33
Total	235	144	86	465	100

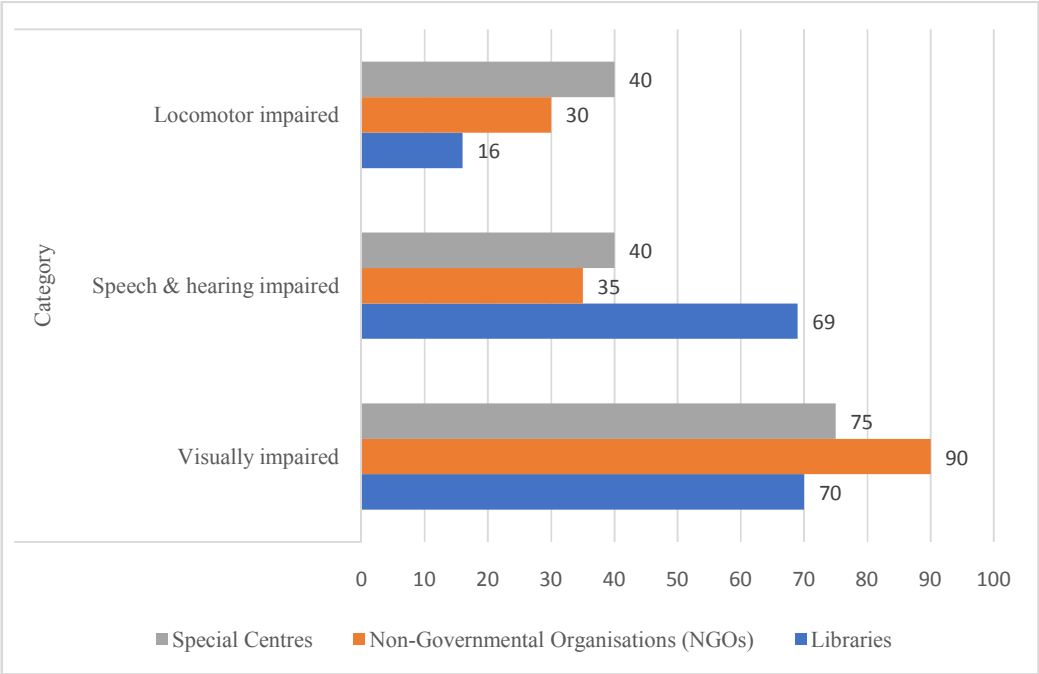

Figure.3 Institution wise distribution of sample

Distribution of sample according to the institutions under study is shown in Table.4. As the users are differently abled and the institutions are functioning for these people only, investigator selected sample in equal percentage from these institutions, ie, 33.33% of respondents from each institution.

Status (type of users) wise distribution of sample

Distribution of sample according to the status are depicted in the table 5.

Table 5

Status wise distribution of sample

Status	Frequency	Percentage
Student	375	80.65
Teaching faculty	25	5.37
Others	65	13.98
Total	**465**	**100**

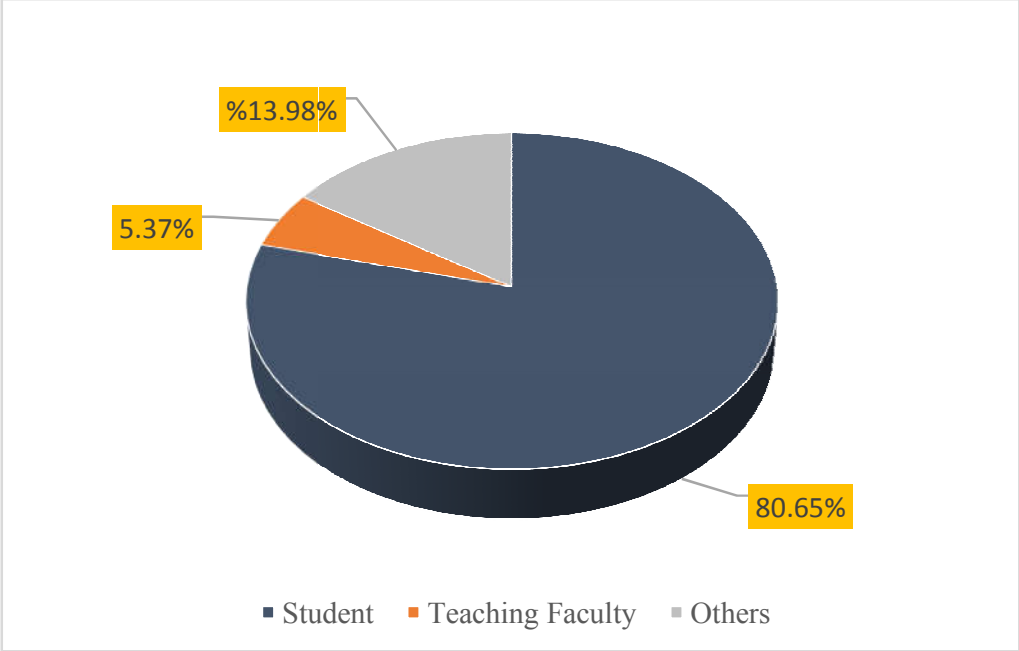

Figure 4 Status wise distribution of sample

Data given in the table 5 and figure 4 indicates that a good number of users belongs to student's community (80.65%). 5.37% belongs to teaching faculty and 13.98% belongs to other category of users. It is clear from the above table that student's community are more in number than other two

categories because core group of assistive technology users are the student's group.

Category wise distribution of sample (Disability wise)

Table 6

Category wise distribution of sample

Category	Frequency	Percentage
Visually Impaired	235	50.54
Speech & Hearing impaired	144	30.97
Locomotor impaired	86	18.49
Total	**465**	**100**

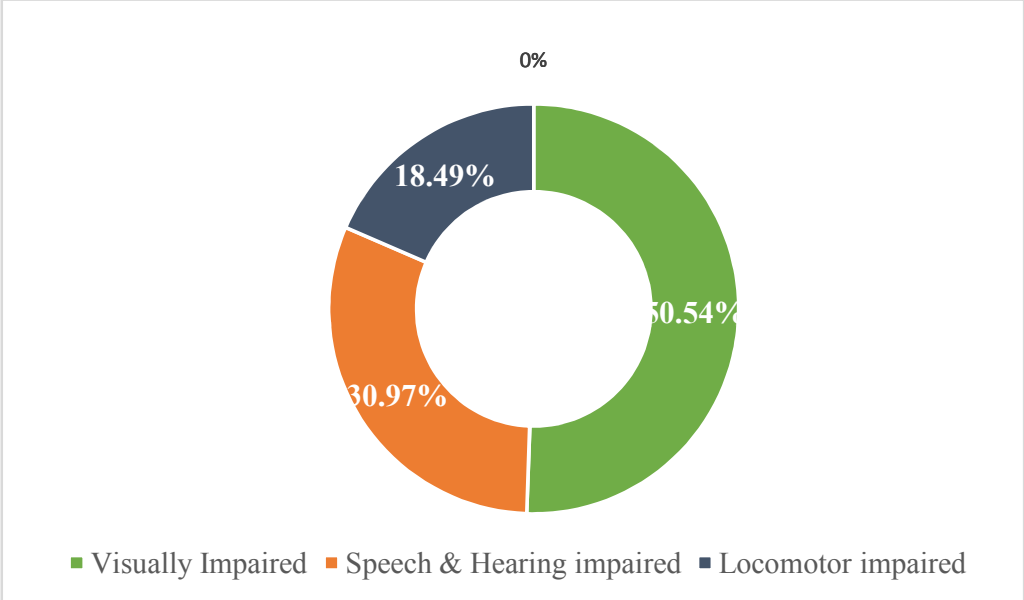

Figure.5 Category wise (disability wise) distribution of sample

It is evident from table 6 and figure 5 that, among the category of assistive technology users under study, visually impaired constitutes 50.54%

followed by the speech & hearing impaired (30.97%) and locomotor impaired (18.49%) persons. It is also clear that visually impaired forms a major portion among the other two categories in using assistive technology for information support.

3.2.3 Data types, collection methods and tools used for the study

In the research process, findings are normally depending on data types, data collection methods, tools used for data collection etc. If the data is not relevant or biased or invalid, results of the investigation is will be incorrect. There are mainly two types of data, i.e, Primary and secondary data are used in this study.

- **Data collection**

Collection of Primary data

Primary data regarding this research were collected by using questionnaire and schedule.

Questionnaire

With the help of supervising teacher and based on the study of related literature, investigator prepared a structured questionnaire and it contained 6 parts. i.e., A, B, C, D, E. Part A contained personal details such as gender, age, name of institution, academic status and category of differently abled persons. Part B contained questions to analyse facilities provided by the

institutions for the differently abled users. Part C contained questions about the use of ICT based information resources/devices/tools. Part D asks about the questions about awareness and use of assistive hardware, software etc Part E contained questions to assess the satisfaction and barriers about the assistive technologies for the differently abled.

Schedule

To collect details of each institution /organizations providing assistive technologies for these differently abled persons, investigator prepared a schedule. The authorities of each institutions were interviewed using this schedule.

Collection of Secondary data

In a research study secondary data are also important to fulfil the purpose. In this study, secondary data such as - differently abled persons—definition, different categories, different governmental level policies and Acts for them, assistive technologies for information support for them etc. published in books, journals, (printed), online journals, websites, official records, of various institutions/organisations were collected and made use for this study.

Data collection procedure

In this study, investigator adopted a combination of methods for data collection, as the users are differently abled. i.e, questionnaire method, interview method and personal observation. In order to collect data, investigator distributed

3.2.4 Scaling technique used

Likert-type scale or summated scale is used for the analysis of question dealing with different rating. Here respondents are freedom of agreement and disagreement with each statement or option. Here the investigator used the 3-point scale in the study.

Table 7

Three Point Likert scale

Sl. No	Scale used	Scoring
1	Fully Satisfied To a greater Extent	3
2	Satisfied To a moderate Extent	2
3	Not Satisfied To a lesser Extent	1

3.2.5 Statistical techniques used for analysis

The following statistical techniques were used to analyse the collected data.

- **Percentage method**

Percentage method is used to concise the collected data.

- **Weighted average mean**

It is the method of calculating central tendency of a given data. Weightage was given to each option on the basis of their preferences. Higher weightage is given to first preference and lowest weightage is given to last preference.

- **Chi- square test**

Chi-squire test is a parametric test in statistics, which is used to check the significance of association between variables in the study. Here it is used to check the association between different category of users and their satisfaction level with assistive technologies, computer literacy.

3.2.6 Consolidation of data

Collected data through questionnaire were consolidated using MS Excel 2010 and further statistical tests were done by using SPSS and MS Excel. Findings, Suggestions and recommendations were obtained on the basis of this analysis.

3.2.7 Citation style used

Reference and bibliography are prepared as per the rules of American Psychological Association (APA style) 6th edition.

3.3 Conclusion

Methodology chapter is one of the very important chapters of a research work. It gives a clear lay out of the research. *Ie*., from this chapter one can got all about the statistical techniques for data analysis, citation style used in the report etc. for research.

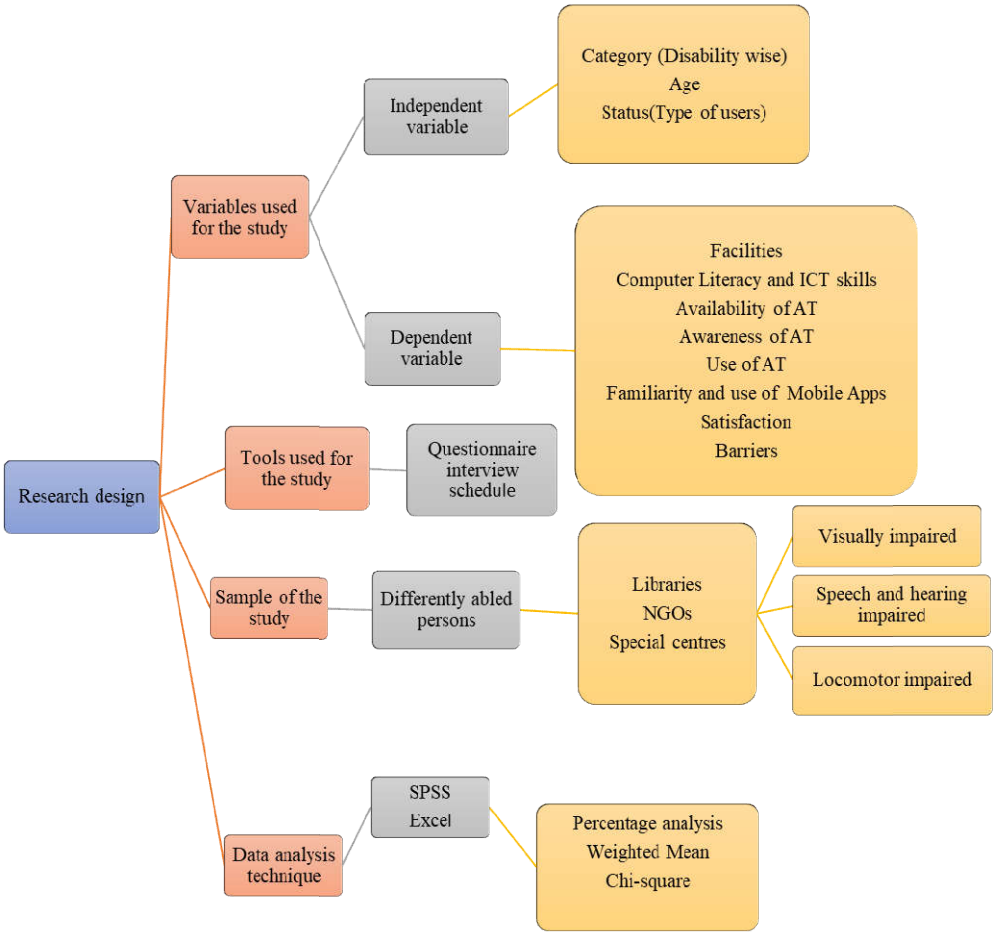

Figure 6. Research design

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4.1 Introduction

The analysis of data is one of the most important stages of research process. It involves the critical examination of the data collected, keeping the objectives of the study in mind. Quantitative analysis is mostly done in social science research with various statistical techniques.

This chapter deals with analysis and interpretation of the data collected with the help of questionnaire from the users of the three types of institutions under study, i.e., Libraries, Non-Governmental organisations and special centres. The collected data are analysed and presented in the forms of tables and diagrams with necessary explanations.

The present study is intended to analyse the awareness and use of assistive technologies for differently abled persons in Kerala and the collected data is analysed on the basis of independent variables such as category (disability wise) of users status (type of users) and institution wise (satisfaction level). The collected data was subjected to various statistical tests like simple percentage analysis, weighted mean score, chi square test etc.

Simple percentage analysis was used to carry out the general analysis of the data. Weighted mean score is used to find out the preference of using various techniques and tools used for the differently abled person's

information support. Chi square test was used to find out the association between independent variable with dependent variable, In this study, it is used to find out the association between level of satisfaction, perception about the availability of assistive technologies etc.

4.2 Facilities and services provided in the institutions

Information access is the major concern about the differently abled persons to bring them into the mainstream of the society. As they are not able to access information directly as other normal persons, specialised facilities and services should be provided for their overall development. So here in following tables data regarding the facilities and services are analysed in detail.

4.2.1. Geographical distribution- Category wise

Table 8

Geographical distribution-Category wise

Categories	Geographic Area		Sample Total
	Rural	Urban	
Visually Impaired	160 (68.09)	75 (31.91)	235
Speech & Hearing Impaired	134 (93.06)	10 (6.94)	144
Locomotor Impaired	64 (74.42)	22 (25.58)	86
Aggregate	358 (76.99)	107 (23.01)	465

(The figures in bracket indicates the respective percentage)

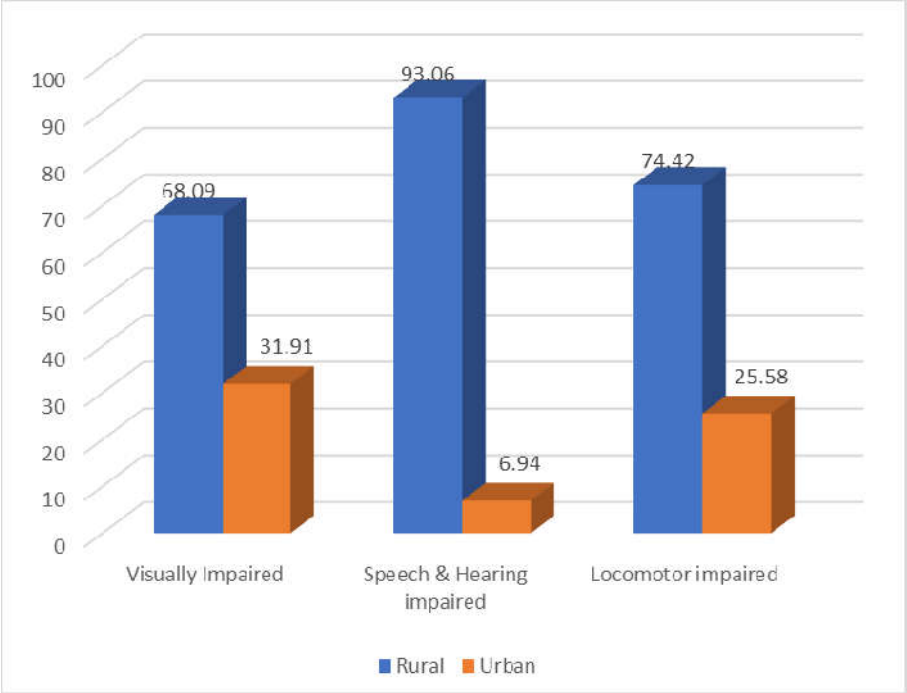

Figure.7 Geographical distribution-category wise

Table. 8 shows that among the respondents, 68.09% of visually impaired persons opined about the geographical location of institutions from where they obtain assistive technology are from rural area and only 31.91% are from urban area. 93.6% of speech & hearing-impaired persons approach the institutions in rural area, only 6.94% from urban area. Among the locomotor impaired persons, 74.42% obtain assistive technology from the institution in rural area and only 25.58% are from urban area. The data also depicted in figure 7.

4.2.1.1Geographical distribution- Status (type of users) wise

There are mainly three types of users comes under the purview of this study. They are students, teaching faculty and others. Here 'others' include

non-teaching staff such as office staff, librarians, and three researchers. So, the status (type of users) wise distribution is given under Table 9, as

Table 9

Geographical distribution- Status wise

Status	Geographic Area		Sample Total
	Rural	Urban	
Student	279 (74.4)	96 (25.6)	375
Teaching faculty	22 (88)	3 (12)	25
Others	57 (87.69)	8 (12.31)	65
Aggregate	358 (76.99)	107 (23.01)	465

(The figures in bracket indicates the respective percentage)

Data in the Table 9 depicted that 74.4% of students, 88% of teaching faculty, 87.69% of others are from rural area whereas 25.6% of students are from urban area followed by almost equal percentage of teaching faculty and others.

4.2.2 Infrastructural facilities in the institutions

Various institutions providing information sources and assistive technologies are analysed here in the Table 10.

Table 10

Institutions -Category wise

Institutions	Category			Sample total
	Visually impaired	Speech & hearing impaired	Locomotor impaired	
Libraries	70 (45.16)	69 (44.52)	16 (10.32)	155
Non-Governmental Organisations (NGOs)	90 (58.06)	35 (22.58)	30 (19.35)	155
Special Centres	75 (48.39)	40 (25.81)	40 (25.80)	155
TOTAL	235 (50.53)	144 (30.96)	86 (18.49)	465

(The figures in bracket indicates the respective percentage)

As per the data in the Table 10, various institutions under study are, libraries and, Non-Governmental organisations and special centres in Kerala. The category wise analysis of differently abled persons shows that a major representation, 58.06% of visually impaired are in NGOs followed by 48.39% of visually impaired persons in special centres. While 44.52% of Speech & hearing impaired in libraries an 25.81% of speech & hearing in special centres are good users of these institutions for their information support. A good number of locomotor impaired also these institutions for approaching assistive technologies for information support.

Table 11

Institutions - status wise

Status	Institutions			Total
	Libraries	NGOs	Special Centres	Sample
Student	149 (39.73)	85 (22.67)	141 (37.60)	375
Teaching faculty	7 (28)	15 (60)	3 (12)	25
Others	4 (6.15)	46 (70.76)	15 (23.07)	65
Aggregate	160 (34.40)	146 (31.40)	159 (34.20)	**465**

(The figures in bracket indicates the respective percentage)

The Table 11 shows status wise analysis of users in the institutions, here students from libraries (39.73%) and from special centres (37.60) are the good users of it. A major representation of 'teaching faculty' and others are using the non-government organisations for their information support.

Table 12

Infrastructural facilities in the institutions- Category wise

Facilities	Category						Sample Total
	Visually Impaired		Speech & hearing Impaired		Locomotor Impaired		
	Yes	No	Yes	No	Yes	No	
Convenient Place	204 (86.81)	31 (13.19)	132 (91.7)	12 (8.3)	71 (82.56)	15 (17.44)	465
Clear Entrance/opening/Doors	222 (94.47)	13 (5.53)	135 (93.75)	9 (6.25)	80 (93.02)	6 (6.98)	465
Ramps /Elevators	210 (89.36)	25 (10.64)	131 (90.97)	13 (9.03)	70 (81.4)	16 (18.6)	465
Sufficient seating/lighting /ventilation	235 (100)	0	144 (100)	0	8 (100)	0	465

(The figures in bracket indicates the respective percentage)

The Table12 shows the data regarding the infrastructural facilities. Among the visually impaired persons, 86.81% opined that the location of institution is in convenient place and a minor portion, ie, 13.19% opined as not in convenient place. Like, majority of the speech & hearing persons and locomotor impaired persons, ie, 91.7% and 82.56%, respectively have the positive opinion whereas only 8.3% and 17.44% responded as not in convenient place. Like, responses about the entrance and doors, in order to make easy movement inside the institutions, 94.47% visually impaired, 93.74% of the Speech & hearing and 93.02% of the locomotor impaired persons have the positive response while 5.53% of the visually impaired , 6.25% of the speech & hearing and 6.98% of the locomotor impaired opined not a clear entrance or openings in the institutions. 89.36% of the visually impaired responded positively about the ramps/elevators followed by the 90.97% speech & hearing impaired and 81.4% locomotor impaired. But some responses show a lack of this facility, ie, minority among the three categories mentioned in some portions inside the institutions, there is no ramp or lift and such responses are from 10.64% visually impaired,9.03% speech & hearing and 18.6% locomotor impaired. But about the seating, lighting and ventilation, all the categories have positive response only.

Table 13

Infrastructural facilities in the institutions- status wise

Facilities	Status						Sample Total
	Student		Teaching Faculty		Other		
	Yes	No	Yes	No	Yes	No	
Convenient Place	320 (85.33)	55 (14.67)	19 (76)	6 (24)	59 (90.77)	6 (9.23)	465
Clear Entrance/opening/Doors	301 (80.27)	74 (19.73)	20 (80)	5 (20)	58 (89.24)	7 (10.76)	465
Ramps /Elevators	310 (82.67)	65 (17.33)	18 (72)	7 (28)	45 (69.24)	20 (30.76)	465
Sufficient seating/lighting /ventilation	375 (100)	0	25 (100)	0	65 (100)	0	465
Sample Total	375		25		65		

(The figures in bracket indicates the respective percentage)

From the Table 13, it is found that student users have a positive opinion regarding the location of the institutions with a response of 85.33 %. Only 14.67% have negative response. Whereas, 76% of the teaching faculty and 90.77% of other users have positive reply. Almost 80% of all the three types users have a positive response regarding Entrance and doors in the institutions. While, 82.67% of the student user group, 72% of the teaching faculty, 69.24% of other user group responded as 'yes' to the provision of ramps/elevators in the institutions. All the three types users have Cen percentage opinion regarding the sufficient seating, lighting, ventilation etc in the institutions they are approaching for their information need.

4.2.3 Frequency of visit

Frequency of visits by the users indicates that how frequent these differently abled persons are visiting the institutions for enriching their knowledge for their overall development. So, the respondents were asked to express their opinion about the frequency of visit to the institutions which provides assistive technology for their information support.

The data given in the Table 14 indicates the frequency of visit to the institutions by different category of users. It mentioned that 56.60% of the visually impaired, 77.08% of speech & hearing impaired and 82.56% of the locomotor impaired are daily visitors to these institutions. Moreover 27.66% of the visually impaired, 19.44% of the speech & hearing impaired and 13.95% of locomotor impaired are visit in alternate days. But 5.53% of the visually impaired and only 1.39% of the speech & hearing-impaired visit twice in a week.10.21% of the visually impaired, 2.08% of the speech & hearing impaired and 3.49 % of the locomotor impaired visit only in once in a week.

Table 14

Frequency of visit – Category wise

Category	Frequency of visit				Sample Total
	Daily	**Alternate days**	**Twice in a week**	**Once in a week**	
Visually impaired	133 (56.60)	65 (27.66)	13 (5.53)	24 (10.21)	235
Speech & hearing impaired	111 (77.08)	28 (19.44)	2 (1.39)	3 (2.08)	144
Locomotor impaired	71 (82.56)	12 (13.95)	0	3 (3.49)	86
Aggregate	315	105	15	30	**465**

(The figures in bracket indicates the respective percentage)

The above analysis shows that daily visiting respondents are more in number than other visitors. It also shows that a better number of users are also visit in alternate days. Hence these institutions should make necessary provision of assistive technology to attract more users to these institutions in order to bring them into the mainstream of the society.

Table 15

Frequency of visit – Status wise

Status	Frequency of visit				Sample Total
	Daily	Alternate days	Twice in a week	Once in a week	
Students	279 (74.4)	81 (21.6)	7 (1.87)	8 (2.13)	375
Teaching faculty	9 (36)	9 (36)	1 (4)	6 (24)	25
Others	27 (65)	15 (41.54)	7 (10.77)	16 (24.62)	86
Aggregate	315	105	15	30	**465**

(The figures in bracket indicates the respective percentage)

Status wise analysis of the Table 15, shows that 'students' are the most vibrant users of these category, as they were using the library with a response of '(74.4%) and 'daily'. 'Teaching faculty' have a response of 36% with 'daily' and alternate days'. In the case of "others"24.62% are visiting once in a week.

4.2.4. Time spent in the institution

Here investigator made an attempt to find out how much time these users spent in the institutions for their information support. So, the respondents were asked to mention the time frequency in four-time intervals. Data regarding the time spent is illustrated in Table 16.

Table 16

Time spent in the institution- Category wise

Category	Time spent				
	Below one hour	**Average one hour**	**1-5 hours**	**More than 5 hours**	**Sample Total**
Visually impaired	2 (0.85)	6 (2.55)	168 (71.49)	59 (25.11)	235
Speech & hearing impaired	0	0	133 (92.36)	11 (7.64)	144
Locomotor impaired	0	1 (1.16)	82 (95.35)	3 (3.49)	86
Aggregate	2	7	383	73	**465**

(The figures in bracket indicates the respective percentage)

The Table 16 indicates that majority of the users, i.e., 71.49% of the visually impaired, 92.36%of the speech & hearing and 95.35% of the locomotor impaired users spent time between 1-5 hours in these institutions. Also, 25.11% of the visually impaired and 11% of the speech & hearing and only 3% of the locomotor impaired responded that they spent time more than five hours. Only 6% of the visually impaired and 1% of locomotor impaired are spending average on hour and only 2% of the visually impaired users spent time below one hour.

Table 17

Time spent in the institution- Status wise

Status	Time spent				
	Below one hour	**Average one hour**	**1-5 hours**	**More than 5 hours**	**Sample Total**
Student	2 (0.53)	7 (1.87)	315 (84)	51 (13.6)	375
Teaching faculty	0	0	13 (52)	12 (48)	25
Others	0	0	12 (48)	10 (15.38)	65
		Total			465

(The figures in bracket indicates the respective percentage)

The data in the Table 17 shows the 'teaching faculty', 48% are spending the time in the institution more than 5 hours. 84% of students, 52% of teaching faculty and 12% of others spent 1-5 hours in the institution. The analysis shows a difference in the time spent and status of the users.

The overall analysis shows that as these many of the institutions are devoted for the differently abled, majority of the users spent more time for using assistive technology for their information support.

4.2.5 Purpose of visit

Here investigator tries to understand various purpose of visiting on the basis of their preference of use, ie, the users were asked to indicate their purpose of visit and the data regarding it are depicted in Table 18.

Table 18

Purpose of visit- Category wise

Various Purposes	Category			Weighted mean	Rank
	Visually impaired	Speech & hearing impaired	Locomotor impaired		
To collect uptodate information	4.67	3	1.77	3.15	3
To obtain employment information	5.32	3.5	2.11	3.65	2
To obtain educational information	6.53	4	2.39	4.31	1
To refer online journals/database	3.87	2.08	1.49	2.48	4
To read online newspapers	3.07	1.67	1.03	1.92	5
To collect motivational information	0.35	0	0.02	0.13	7
To collect recreational information	1.60	0.66	0.55	0.94	6
To interact with fellow being	0.02	0	0	0.01	8

The Table 18 shows the weighted mean score of the purpose of visit of users. Visually impaired (Mean-6.53), speech & hearing (Mean-4) and locomotor (Mean-2.39) gives first preference to educational information followed by the second preference of employment information with the mean value of Visually impaired 5.32, speech & hearing impaired 3.5 and the locomotor impaired 2.11. Third preference to collect uptodate information

with a mean value of 4.67, 3 and 1.77 of visually impaired, speech & hearing and locomotor impaired persons respectively. Fourth, fifth and sixth preference of all the three categories are refer online journals/database, read online newspapers and collect recreational information with a mean value of 3.87, 3.07 and 1.60 by visually impaired, 2.08, 1.67 and 0.66 by speech and hearing category and 1.49, 1.03 and 0.55 by locomotor impaired category.

Table 19

Purpose of visit – Status wise

Various Purposes	Category			Weighted mean	Rank
	Student	Teaching faculty	Other		
To Collect uptodate information	7.79	0.52	1.13	3.15	3
To obtain employment information	8.92	0.56	1.46	3.65	2
To obtain educational information	10.42	0.69	1.81	4.31	1
To refer online journals/database	5.92	0.40	1.13	2.48	4
To read online newspapers	4.50	0.36	0.90	1.92	5
To collect motivational information	0.28	0.06	0.03	0.13	7
To collect recreational information	2.02	0.24	0.55	0.94	6
To interact with fellow being	0.02	0	0	0.01	8

The data in the Table.19 shows the status wise variation of purpose of visit. Students with mean value 10.42 have the preference to educational information., whereas with 8.92 response have to obtain educational information.

As per the overall analysis of the weighted mean score of the preference of purpose of visit, the most preferred one is to obtain educational information with a weighted mean score of 4.31, followed by employment information with a weighted mean score of 3.65, followed by to collect uptodate information with 3.15, refer online journals/database with 2.48, to read online newspapers with a weighted mean score of 1.92, to collect recreational information and motivational information having a weighted mean score of 0.94 and 0.13 respectively. To interact with fellow being have a weighted mean score of 0.01 only.

4.2.6 Method adopted to locate information

As the differently abled persons are facing some difficulties to access the exact information they need, the investigator here tries to understand the methods adopted by these people to locate the information they want. The responses from the users are depicted in Table 20.

Table 20

Methods adopted to locate information - Category wise

Category	Methods adopted		
	With the assistance of trained staff	**Directly from the resources**	**With the help of friends**
Visually impaired	235 (100)	7 (2.98)	22 (9.36)
Speech & hearing impaired	144 (100)	13 (9.03)	11 (7.64)
Locomotor impaired	86 (100)	70 (81.40)	63(73.26)

(The figures in bracket indicates the respective percentage)

The data in the Table 20 shows that all the users, ie, 100% of visually impaired, speech & hearing and locomotor impaired depend on trained staff to locate the information they want. All the categories of the users are also obtaining information as directly from the resources and also with the help of friends. The total response exceeds 100 % because of the respondents were allowed multiple choice answering.

4.2.7 Availability of information sources

Differently abled persons should have same right to information as the other normal persons. Different types of disability require different types of specialised information sources, such as braille books, daisy books, video products with captioning, assistive software and hardware etc.

Here the investigator has tried to understand about various information sources available in the institutions where these people are approaching for assistive information support. The responses are depicted in the table 21, 22 and 23.

Table 21

Availability of information sources for visually impaired

Information Resources	Availability
Braille	141 (60)
Daisy	235 (100)
Audio Books	235 (100)
Video Products with Caption	124 (52.77)
Sample Total	235

(The figures in bracket indicates the respective percentage)

The various institutions under study provides various information sources from conventional to advance for all categories under study. From the Table 21, all visually impaired persons, ie, 100% opined that the availability of daisy books and audio books in the institutions they are approaching for their information support. The visually impaired (60%) persons opined about the availability of the braille books and 52.77% opined about the availability of video products with voice scripts in their institutions.

Table 22

Availability of information sources for speech & hearing impaired

Information Resources	Availability
TTY/TDD	144 (100)
Video Products with Caption	144 (100)
Sample Total	144

(The figures in bracket indicates the respective percentage)

All speech & hearing categories responded about the availability of text telephone devices and video products with captioning as per the data in the Table 22.

Table 23

Availability of information sources for locomotor impaired

Information Resources	Availability
Printed Documents	79 (91.86)
Audio Books	80 (93.02)
Sample Total	86

(The figures in bracket indicates the respective percentage)

As per the Table 23, 91.86% of the locomotor impaired persons responded about the availability of audio books and 93.02% mentioned about the availability of printed documents.

Table 24

Availability of information sources for the differently abled- status wise

Information sources	Status		
	Student	**Teaching faculty**	**Other**
Braille books	92 (24.53)	18 (72.00)	31 (47.69)
DAISY books	176 (46.93)	25 (100.00)	34 (52.31)
Audio books	241 (64.27)	25 (100.00)	47 (72.31)
Printed documents	66 (17.6)	0	14 (21.54)
Video products with voice scripts	96 (25.6)	14 (56.00)	20 (30.77)
TTY/TDD	127 (33.87)		17 (26.15)
Video products with captioning	127 (33.87)		17 (26.15)

(The figures in bracket indicates the respective percentage)

The data in the Table 24, indicates the availability of various information sources for the differently abled. Here the 100%of the teaching faculty opined about the availability of Daisy book and audio books. 64.27% of audio books, 46.93% of Daisy books, 24.53% of Student 'group about the availability of it. Almost all sources are available according to 'other' group.

4.2.8. Use of information sources

Here investigator tried to find out whether the available information resources are used by the differently abled persons for their information support.

Table 25

Use of information sources by visually impaired

Information Resources	Use
Braille	141 (60)
Daisy	201 (85.53)
Audio Books	225 (95.7)
Video Products with Caption	124 (52.77)

(The figures in bracket indicates the respective percentage)

The analysis of data in the Table 25 shows that the majority of the visually impaired persons (95.7%) using audiobooks, followed by daisy books (85.53%), braille books (60%).

Table 26

Use of information sources by speech &hearing Impaired

Information Resources	Availability
TTY/TDD	144 (100)
Video Products with Caption	124 (52.77)

(The figures in bracket indicates the respective percentage)

According to Table 26, all speech and hearing persons are using text telephone devices whereas 52.77% opined about the usage of video products with captioning.

Table 27

Use of information sources by locomotor Impaired

Information Resources	Availability
Printed Documents	79 (91.86)
Audio Books	80 (93.02)

(The figures in bracket indicates the respective percentage)

As the locomotor impaired persons under study are wheelchair users, they are able to use the printed documents and 91.86% opined about the usage of it and 93.02 % are using audio books also. The percentage exceeds 100% because the respondents were allowed multiple answers.

Table 28

Use of information sources – Status wise

Information sources	Status		
	Student	**Teaching faculty**	**Other**
Braille	92 (24.53)	18 (72.00)	31 (47.69)
DAISY books	174 (46.4)	25 (100.00)	35 (53.85)
Audio books	234 (62.4)	25 (100.00)	48 (73.85)
Printed documents	66 (17.6)	0	14 (21.54)
Video products with voice script	99 (26.4)	15 (60.00)	20 (30.77)
TTY/TDD	127 (33.87)	0	17 (26.15)
Video products with captioning	127 (33.87)	0	17 (26.15)

(The figures in bracket indicates the respective percentage)

Status wise analysis of Table 28, indicates that 62.4% of audiobooks, 46.4%of Daisy, 24.53% of Braille etc are used by the 'student group 'while video products with voice scripts are used upto 26.4%. 100% of teaching faculty are using Daisy books, audio books and 72% of Braille books. Almost all these information sources are used by 'other' group.

4.3 Computer literacy and ICT skills

Tremendous development of information communication technology enables greater opportunities for the differently abled persons. Various ICT supported devices and methods enhance their information support in an effective way. Computer literacy and the ICT skills of the differently abled persons are the two factors relating to assess the awareness about the information technology and were presented in this section. Here investigator tried to understand knowledge level of differently abled persons in computer, how to acquire it, use of smart devices/ICT based tools and ICT based activities and web-based activities.

4.3.1 Computer literacy

Responses regarding computer literacy is depicted in the Table 29.

Table 29

Computer literacy- category wise

Category	Knowledge level			Sample Total	Percent
	Good	Medium	Poor		
Visually impaired	29 (12.34)	206 (87.66)	0	235	100
Speech & hearing impaired	8 (5.56)	136 (94.44)	0	144	100
Locomotor impaired	5 (5.81)	81 (94.19)	0	86	100
Total	42 (9.03)	423 (90.97)	0	465	100

(The figures in bracket indicates the respective percentage)

Overall analysis shows that majority of the differently abled persons have medium knowledge level (90.97%) followed by 9.03% persons with good computer knowledge Data regarding category wise shows that only 12.34% visually impaired persons, 5.56% speech and hearing impaired are good in computer knowledge followed by 87.66% visually impaired persons and 94.44% speech and hearing impaired with medium level knowledge. No one shows poor computer knowledge.

Table 30

Computer literacy -Status wise

Status	Knowledge level			Total
	Good	Medium	Poor	
Student	37 (9.87)	338 (90.13)	0	375
Teaching faculty	5 (20.00)	20 (80.00	0	25
Other	0	65 (100)	0	65
Total	42 (9.03)	423 (90.97)	0	465

Chi = 61.3 df :4 P =0.000 It is significant at 0.5 level

Herechi square test is applied to check the relation between variables. It is found that there exists significant relation between status and knowledge level of computer.

The overall analysis shows that majority of the differently abled persons have knowledge in computer to equip with the advancement of technology.

4.3.2 Mode of acquisition of computer knowledge

The advancement in information communication technology always makes things possible and in an efficient way to the differently abled persons. So now a days it is inevitable to the differently abled persons to have a good knowledge in ICT to cope up with the present and so here the investigator tried to get the responses about the mode of acquisition of computer knowledge by these differently abled persons. The data regarding it is depicted in the following Table 31.

Table 31

Mode of acquisition of computer knowledge- Category wise

Category	Mode of acquisition				Sample Total
	Self-learning	By attending courses	From friends	Other Mode	
Visually impaired	10 (4.26)	217 (92.34)	24 (10.21)	86 (36.60)	235
Speech & hearing impaired	0	120 (83.33)	20 (13.89)	71 (49.31)	144
Locomotor impaired	52 (60.47)	77 (89.53)	43 (50.00)	29 (33.72)	86
Total	62 (13.3)	414 (89.03)	87 (18.71)	186 (40)	465

(The figures in bracket indicates the respective percentage)

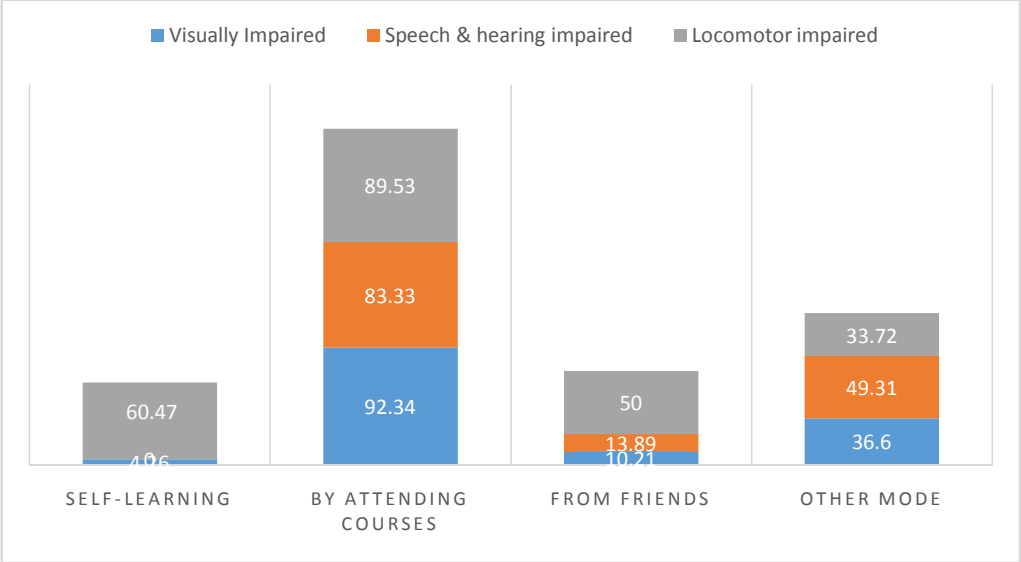

Figure 8 Mode of acquisition of computer knowledge

The data presented in Table 31, indicate that majority of the users acquired knowledge in computer by undergoing computer courses with a response of 92.34% by visually impaired, 83.33% by speech & hearing impaired and 89.53% by locomotor impaired. It further reveals the higher response about computer knowledge acquired from 'other mode', which includes the 'computer training' provided in the institutions, they are approaching for information support, 'online tutorials' etc. As the users are differently abled, they are also approaching friends for their information needs, with a response rate of 10.21% of visually impaired, 13.89% of speech & hearing impaired and 50% from locomotor impaired. As the locomotor impaired are wheelchair users, there is a good response in self-learning of computers with a response of 60.47%. The percentage exceeds 100% because the respondents were allowed multiple answers.

Table 32

Mode of acquisition of computer knowledge- Status wise

Status	Mode of acquisition			
	Self-learning	By attending courses	From friends	Other Mode
Student	10 (2.67)	333 (88.88)	36 (9.6)	157 (41.87)
Teaching faculty	12 (48)	16 (64)	12 (48)	9 (36)
Other	40 (61.54)	65 (100)	34 (52.31)	20 (30.77)
Total	62 (13.3)	414 (89.03)	87 (18.71)	186 (40)

Table 32 indicates that, the mode of acquisition of computer knowledge by teaching faculty (48%) and other group (61.54) %by self learning is higher than that of student group. Al the three groups prefer to attend courses for gathering knowledge in computer.

4.3.3 ICT skills

Here the investigator tried to analyse the ICT skills of differently abled users in using the ICT based tools/devices such as computers, mobile phones, printer, scanner etc and ICT based activities such as data entry, pen drive copying, scanning, playing computer games, audio/ video etc and web based

activities such as browsing internet, search engines, email sending and receiving ,Facebook , WhatsApp etc.

4.3.3.1. Use of ICT based tools/devices

The response regarding the use of various ICT based tools/devices are depicted in the following Table 33.

Table 33

Use of ICT based tools/devices- Category wise

ICT tools/ devices	Category	Always	Often	Sometimes	Rarely	Never	Total
Desktop	Visually impaired	119 (50.64)	98 (41.70)	18 (7.66)	0	0	235
	Speech & Hearing impaired	87 (60.42)	57 (39.58)	0	0	0	144
	Locomotor impaired	49 (56.98)	30 (34.88)	7 (8.14)	0	0	86
Laptop	Visually impaired	102 (43.40)	114 (48.51)	19 (8.09)	0	0	235
	Speech & Hearing impaired	63 (43.75)	81 (56.25)	0	0	0	144
	Locomotor impaired	22 (25.58)	50 (58.14)	14 (16.28)	0	0	86
Notebook	Visually impaired	18 (7.66)	17 (7.23)	96 (40.85)	55 (23.40)	26 (11.06)	212
	Speech & Hearing impaired	0	0	90 (62.50)	0	0	90
	Locomotor impaired	2 (2.33)	53 (61.63)	5 (5.81)	26 (30.23)	0	86
	Visually impaired	2 (0.85)	60 (25.53)	89 (37.87)	67 (28.51)	0	218

ICT tools/ devices	Category	Always	Often	Sometimes	Rarely	Never	Total
Tablet	Speech & Hearing impaired	0	0	109 (75.69)	27 (18.75)	0	136
	Locomotor impaired	30 (34.88)	3 (3.49)	47 (54.65)	4 (4.65)	0	84
Mobile Phone	Visually impaired	214 (91.06)	5 (2.13)	16 (6.81)	0	0	235
	Speech & Hearing impaired	130 (90.28)	14 (9.72)	0	0	0	144
	Locomotor impaired	77 (89.530)	9 (910.47)	0	0	0	86
Printer	Visually impaired	0	17 (7.23)	36 (15.32)	181 (77.02)	1 (0.43)	235
	Speech & Hearing impaired	0	0	83 (57.64)	59 (40.97)	2 (1.39)	144
	Locomotor impaired	1 (1.16)	24 (27.91)	32 (37.21)	29 (33.72)	0	86
Scanner	Visually impaired	24 (10.21)	53 (22.55)	157 (66.81)	1 (0.43)	0	235
	Speech & Hearing impaired	0	0	83 (57.64)	59 (40.97)	2 (1.39)	144
	Locomotor impaired	1 (1.16)	24 (27.91)	32 (37.21)	29 (33.72)	0	86

(The figures in bracket indicates the respective percentage)

The Table 33 shows the use of desktop computers, laptop computers, mobile phones etc. As per it, majority of the differently abled persons are using these devices in order to cope up with the present, Desktop computers are 'always' used by the visually impaired persons with a response of 50.64% followed by the laptop computers usage 'often' with a response of 48.51%. It

shows almost equal users are using the devices desktop computers and laptop computers for their information need. Speech & hearing-impaired persons with 60.42% and locomotor impaired with 56.98% 'always' using the desktop computers. Laptop computers are 'often' used by visually impaired with 48.5% response and, speech & hearing with 56.25% and the locomotor impaired with 58.14%. Whereas notebook computers and tablets 'sometimes' used by these three categories with a greater response of speech and hearing-impaired persons with 62.50 % and 75.69% respectively. The responses regarding the use of mobile phones, ie, 91.06% of visually impaired and 90% of speech & hearing impaired and 89.53% of locomotor impaired, shows all the three categories are 'always' using mobile phones for their day to day to information support. Among the three categories, there is not a high usage of printer and scanners, but the response shows that, they are using it whenever need arises.

Table 34

Use of ICT based tools/devices- Status wise

ICT based tools/devices	Use	Status		
		Student	Teaching Faculty	Other
Desktop computer	Always	206 (54.93)	11 (44.00)	38 (58.46)
	Often	151 (40.27)	14 (56.00)	20 (30.77)
	Sometimes	18 (4.8)	0	7 (10.77)
	Rarely	0	0	0
	Never	0	0	0
	Total	375	25	65
laptop computer	Always	165 (44.00)	7 (28.00)	15 (23.08)
	Often	191 (50.93)	9 (36.00)	45 (69.23)
	Sometimes	19 (5.07)	9 (36.00)	5 (7.69)
	Rarely	0	0	0
	Never	0	0	0
	Total	375	25	65
Notebook computer	Always	30 (8.00)	4 (16.00)	0
	Often	31 (8.27)	8 (32.00)	45 (69.23)
	Sometimes	219 (58.40)	4 (16.00)	0
	Rarely	66 (17.60)	9 (36.00)	20 (30.77)
	Never	29 (7.73)	0	0
	Total	375	25	65
Tablet	Always	10 (2.67)	5 (20.00)	25 (38.46)
	Often	63 (16.80)	4 (16.00)	0
	Sometimes	202 (53.87)	12 (48.00)	40 (61.54)
	Rarely	98 (26.13)	4 (16.00)	0
	Never	2	0	0

ICT based tools/devices	Use	Status		
		Student	Teaching Faculty	Other
		(0.53)		
	Total	375	25	65
Mobile phones	Always	354 (94.4)	16 (64.00)	65 (100.00)
	Often	5 (1.33)	9 (36.00)	0
	Sometimes	16 (4.27)	0	0
	Rarely	0	0	0
	Never	0	0	0
	Total	375	25	65
Printer	Always	0	1 (4.00)	0
	Often	17 (4.53)	4 (16.00)	20 (30.77)
	Sometimes	119 (31.73)	7 (16.00)	25 (38.46)
	Rarely	236 (62.93)	13 (52.00)	20 (30.77)
	Never	3 (0.8)	0	0
	Total	375	25	65
Scanner	Always	0	1 (4.00)	0
	Often	24 (6.4)	4 (16.00)	20 (30.77)
	Sometimes	136 (36.27)	7 (16.00)	25 (38.46)
	Rarely	212 (56.53)	13 (52.00)	20 (30.77)
	Never	3 (0.8)	0	0
	Total	375	25	65

(The figures in bracket indicates the respective percentage)

The status wise analysis in the Table 34 indicates that there is almost a good usage of these devices by teaching faculty and other. Printers and scanners have often use by 'other' group whereas, mobile phones are using always by these groups.

4.3.3.2. Level of knowledge of ICT based tools/devices

Now a days to access the information they need, there is a knowledge of information communication devices/tools is must. So, the investigator here tried to get the responses about the level of knowledge regarding following tools.

Table35

Level of knowledge of ICT based tools/devices – Category wise

ICT tools/devices	Category	Excellent	Good	Average	Poor	Very Poor	Sample Total
Desktop	Visually impaired	41 (17.45)	169 (71.91)	15 (6.38)	8 (3.4)	2 (0.85)	235
	Speech & Hearing impaired	81 (56.25)	57 (39.58	6 (4.17)	0	0	144
	Locomotor impaired	7 (8.14)	79 (91.86)	0	0	0	86
Laptop	Visually impaired	12 (5.10)	194 (82.55)	17 (7.23)	10 (4.25)	2 (0.85)	235
	Speech & Hearing impaired	87 (60.42)	47 (32.64)	10 (6.94)	0	0	144
	Locomotor impaired	7 (8.14)	79 (91.86)	0	0	0	86
Notebook	Visually impaired	0	59 (25.11)	157 (66.81)	15 (6.38)	4 (1.70)	235
	Speech & Hearing impaired	2 (1.39)	30 (20.83)	112 (77.78)	0	0	144
	Locomotor	0	66	20	0	0	86

ICT tools/devices	Category	Excellent	Good	Average	Poor	Very Poor	Sample Total
	impaired		(76.74)	(23.26)			
Tablet	Visually impaired	0	156 (66.38)	61 (25.96)	18 (7.66)	0	235
	Speech & Hearing impaired	18 (12.50)	40 (27.78)	82 (56.94)	1 (0.69)	3 (2.08)	144
	Locomotor impaired	0	43 (50.00)	23 (26.74)	20 (23.26)	0	86
Mobile Phone	Visually impaired	134 (57.02)	100 (42.55)	1 (0.43)	0	0	235
	Speech & Hearing impaired	104 (72.22)	40 (27.78)	0	0	0	144
	Locomotor impaired	47 (54.65)	39 (45.35)	0	0	0	86
Printer	Visually impaired	0	4 (1.70)	90 (38.30)	139 (59.15)	2 (0.85)	235
	Speech & Hearing impaired	0	24 (16.67)	120 (83.33)	0	0	144
	Locomotor impaired	3 (3.49)	22 (25.58)	41 (47.67)	20 (23.26)	0	86
Scanner	Visually impaired	0	4 (1.70)	85 (36.17)	144 (61.28)	2 (0.85)	235
	Speaking & Hearing impaired	0	24 (16.67)	120 (83.33)	0	0	144
	Locomotor impaired	3 (3.49)	22 (25.58)	41 (47.67)	20 (23.26)	0	86

(The figures in bracket indicates the respective percentage)

The data depicted in the Table 35 indicates that 71.9% of the visually impaired and 91.86% of the locomotor impaired responded as ‘good’ as the level of knowledge of using desktop computers, but 60.42% of the speech & hearing impaired responded as ‘excellent’. 60.42% of the speech and hearing are ‘excellent’ in using the laptop computers. Whereas notebook computers and tablets have an ‘average’ use by visually impaired with 66.81% and 25.96% respectively and speech & hearing-impaired persons responded as ‘average’ with a response of 77.78% and 56.94%. But the locomotor impaired are far better in using notebook computers and tablets, ie, 76.74% and 50% are responded as ‘good’ in the level of knowledge of using these tools. In the case of ‘mobile phones’ ‘excellent’ response indicated by majority of these three categories. ie, 57.02% of visually impaired, 72.22% of speech & hearing and 54.65% of locomotor impaired persons. In the case of printers, 38.30% of visually impaired indicated as ‘average’ followed by 83.33% of speech & hearing and 47.67% of locomotor impaired persons. 61.28% of visually impaired indicated as ‘poor’ in the using of scanner whereas 83.33% speech & hearing responded as ‘average’ followed by 47.67% of locomotor impaired persons.

Table 36

Level of knowledge of ICT based tools/devices-Status wise

ICT based tools/devices	Use	Status		
		Student	Teaching Faculty	Other
Computer	Excellent	138 (36.8)	7 (28.00)	0
	Good	222 (59.2)	18 (72.00)	65 (100.00)
	Average	15 (4.00)	0	0
	Poor	0	0	0
	Very poor	0	0	0
	Total	375	25	65
Laptop computer	Excellent	101 (26.93)	7 (28.00)	0
	Good	247 (65.87)	18 (72.00)	65 (100.00)
	Average	27 (7.20)	0	0
	Poor	0	0	0
	Very poor	0	0	0
	Total	375	25	65
Notebook computer	Excellent	10 (2.67)	16 (4.00)	0
	Good	164 (43.73)	13 (52.00)	45 (69.23)
	Average	163 (43.47)	8 (32.00)	20 (30.77)
	Poor	31 (8.27)	0	0
	Very poor	7 (1.87)	0	0
	Total	375	25	65
Tablet	Excellent	21 (5.6)	0	0

ICT based tools/devices	Use	Status		
		Student	Teaching Faculty	Other
	Good	193 (51.47)	22 (88.00)	25 (38.46)
	Average	135 (36.00)	3 (12.00)	20 (30.77)
	Poor	23 (6.13)	0	20 (30.77)
	Very poor	3 (0.8)	0	0
	Total	375	25	65
Mobile phones	Excellent	238 (63.47)	7 (28.00)	40 (61.54)
	Good	136 (36.27)	18 (72.00)	25 (38.46)
	Average	1 (0.27)	0	0
	Poor	0	0	0
	Very poor	0	0	0
	Total	375	25	65
Printer	Excellent	0	3 (12.00)	0
	Good	28 (7.47)	2 (8.00)	20 (30.77)
	Average	206 (54.93)	20 (80.00)	25 (38.46)
	Poor	139 (37.07)	0	20 (30.77)
	Very poor	2 (0.53)	0	0
	Total	375	25	65
Scanner	Excellent	0	3 (12.00)	0
	Good	28 (7.47)	2 (8.00)	20 (30.77)
	Average	201	20	25

ICT based tools/devices	Use	Status		
		Student	Teaching Faculty	Other
		(53.60)	(80.00)	(38.46)
	Poor	144 (38.40)	0	20 (30.77)
	Very poor	2 (0.53)	0	0
	Total	375	25	65

(The figures in bracket indicates the respective percentage)

Status wise analysis of Table 36, shows that 100% good use by other group regarding desktop computers, laptop computers etc. A high range of mobile phones usage, printer and scanner are found among the other group than teaching faculty or student.ie, 30.77% of good usage

4.3.3.3. Level of knowledge of ICT based services/activities

Knowledge about the ICT based activities indicate how these people more related to ICT to live in the present. The responses are depicted in the Table.37.

Table 37

Level of knowledge of ICT based services/activities—Category wise

ICT based services	Category	Excellent	Good	Average	Poor	Very Poor	Total
Data Entry	Visually impaired	40 (17.02)	167 (71.06)	28 (11.91)	0	0	235
	Speech & Hearing impaired	63 (43.75)	81 (56.25)	0	0	0	144
	Locomotor impaired	20 (23.25)	57 (66.28)	9 (10.47)	0	0	86
Pen drive Copying	Visually impaired	2 (0.85)	105 (44.68)	110 (46.81)	18 (7.66)	0	235
	Speech & Hearing impaired	63 (43.750	81 (56.25)	0	0	0	144
	Locomotor impaired	37 (43.02)	45 (52.33)	4 (4.65)	0	0	86
Scanning	Visually impaired	0	59 (25.11)	134 (57.02)	40 (17.02)	2 (0.85)	235
	Speech & Hearing impaired	17 (11.81)	122 (84.72)	5 (3.47)	0	0	144
	Locomotor impaired	7 (8.14)	79 (91.86)	0	0	0	86
Playing Computer Games	Visually impaired	4 (1.70)	22 (1.36)	68 (28.94)	128 (54.47)	13 (5.53)	235
	Speech & Hearing impaired	44 (30.56)	80 (55.56)	20 (13.89)	0	0	144
	Locomotor impaired	7 (8.14)	55 (63.59)	24 (27.91)	0	0	86
Playing Audio /Video	Visually impaired	0	18 (7.66)	71 (30.21)	106 (45.11)	40 (17.02)	235
	Speech & Hearing impaired	21 (14.58)	74 (51.39)	26 (18.06)	12 (8.33)	11 (7.64)	144
	Locomotor impaired	7 (8.14)	52 (60.47)	25 (29.07)	2 (2.33)	0	86

(The figures in bracket indicates the respective percentage)

The responses regarding the ICT based activities revealed that 71.06% of visually impaired, 56.25% of speech & hearing impaired and 66.28% of locomotor impaired are 'good' in data entry, whereas 43.75% of speech & hearing impaired are excellent in 'data entry'. Regarding pen drive copying, 46.8% of visually impaired responded as 'average' and 44.68% of visually impaired responded as 'good', whereas 56.25% and 43.75% of speech & hearing responded as 'good' and 'excellent' respectively. Locomotor impaired are almost equally responded, ie, 'excellent' with 43.02% and good as 52.33%. Responses regarding scanning activity indicate that 91.86% of locomotor and 84.72% of speech & hearing are responded as 'good'. 57.02% of visually impaired responded as 'average' followed by 25.11% as 'good' and 17.02% as poor. In these ICT based activities, locomotor impaired persons showed a good response of knowledge about it as 91.86% responded as 'good' in scanning. Playing computer games' have not a high relevance according to visually impaired, which showed 'average' response 0f 28.94% and54.47% showed 'poor' response. Speech & hearing and locomotor impaired showed a good response of 55.56% and 63.59% respectively. Response about playing audio/video indicate that 51.39% of speech & hearing and 60.47% of locomotor impaired are 'good' in this ICT based service, where as 30.21% of visually impaired and 29.07% of locomotor impaired are 'average in playing audio/video.

Table 38

Level of knowledge of ICT based services/ activities—Status wise

ICT based services	Use	Status		
		Student	Teaching faculty	Other
	Excellent	103 (27.47)	7 (28.00)	0
	Good	244 (65.07)	18 (72.00)	65 (100.00)
Data entry	Average	28 (7.47)	0	0
	Poor	0	0	0
	Very poor	0	0	0
	Total	375	25	65
Pen drive copying/CD writing	Excellent	65 (17.33)	12 (48.00)	25 (38.46)
	Good	182 (48.53)	9 (36.00)	40 (61.54)
	Average	128 (34.13)	4 (16.00)	0
	Poor	0	0	0
	Very poor	0	0	0
	Total	375	25	65
Scanning	Excellent	17 (4.53)	7 (28.00)	0
	Good	177 (47.02)	9 (36.00)	65 (100.00)
	Average	139 (37.07)	9 (36.00)	0
	Poor	42 (11.20)	0	0
	Very poor	0	0	0
	Total	375	25	65
Playing Computer Games	Excellent	56 (14.93)	7 (28.00)	0
	Good	108(28.80)	14 (56.00)	45 (69.23)
	Average	77 (20.53)	4 (16.00)	20 (30.77)
	Poor	126 (33.60)	0	0
	Very poor	8 (2.13)	0	0
	Total	375	25	65

ICT based services	Use	Status		
		Student	Teaching faculty	Other
Playing audio/ Video	Excellent	53 (14.13)	7 (28.00)	0
	Good	86 (22.93)	11 (44.00)	45 (69.23)
	Average	93 (24.80)	5(20.00)	20 (30.77)
	Poor	93 (24.80)	0	0
	Very poor	50 (13.33)	0	0
	Total	375	25	65

Status wise analysis of Table 38, shows, that in data entry teaching faculty excellent with 28 % and students with 27.4%, whereas other group with 100%. In Pen drive copying or CD Writing, 48% teaching facility excellent and 17.33% student group, whereas 61.54% of other group are good in it. In scanning an average response by students and teaching faculty in playing computer games and playing computer audio 28% of teaching faculty responded as excellent.

4.3.4. Level of knowledge of web-based activities

Here investigator tried to find out the level of knowledge of web-based activities such as internet browsing, use of search engines, e-mail etc and the responses regarding it are depicted in the following Table 39.

Table 39

Level of knowledge of web-based activities – Category wise

Web based activities	Category	Excellent	Good	Average	Poor	Very Poor	Total
Internet browsing	Visually impaired	23 (9.79)	146 (62.13)	52 (22.12)	10 (4.26)	4 (1.70)	235
	Speech & Hearing impaired	86 (59.72)	58 (40.28)	0	0	0	144
	Locomotor impaired	74 (86.05)	8 (9.30)	4 (4.65)	0	0	86
Search engines	Visually impaired	2 (0.85)	153 (65.10)	68 (28.94)	12 (5.10)	0	235
	Speech & Hearing impaired	25 (17.36)	118 (81.94)	1 (0.69)	0	0	144
	Locomotor impaired	72 (83.72)	10 (11.63)	4 (4.65)	0	0	86
Email	Visually impaired	3 (1.28)	161 (72.77)	59 (25.11)	10 (4.25)	2 (0.85)	235
	Speech & Hearing impaired	63 (43.75)	81 (56.25)	0	0	0	144
	Locomotor impaired	77 (89.53)	9 (10.47)	0	0	0	86
Online catalogue	Visually impaired	2 (0.85)	4 (1.70)	21 (8.94)	133 (56.60)	75 (31.91)	235
	Speech & Hearing impaired	1 (0.69)	22 (15.28)	110 (76.39)	9 (6.25)	2 (1.39)	144
	Locomotor impaired	2 (2.33)	39 (45.35)	44 (51.16)	1 (1.16)	0	86
Social networking sites	Visually impaired	29 (12.34)	145 (61.70)	48 (20.43)	10 (4.26)	3 (1.27)	235
	Speech & Hearing impaired	63 (43.75)	64 (44.44)	17 (11.81)	0	0	144
	Locomotor impaired	59 (68.60)	27 (31.40)	0	0	0	86

(The figures in bracket indicates the respective percentage)

The data depicted in the Table 39 indicate that 59.72% of the speech & hearing and 86.05% are 'excellent' in internet browsing whereas 62.13% of visually impaired responded as 'good'. Regarding the response about the search engines, 65.10% of visually impaired have a response of 'good' followed by 81.94% of speech & hearing impaired, whereas 83.72% of locomotor impaired are 'excellent'. 72.77% of visually impaired responded as 'good' about e-mail sending and receiving followed by 56.25% of speech & hearing impaired but 43.75% of speech & hearing and 89.53% of the locomotor impaired are responded as 'excellent'. Among the three categories under study, only locomotor impaired are responded as 'good' in using online catalogues, whereas among the visually impaired, 56.60% responded as 'poor' and 76.39% of responded as 'average'. About the response regarding the social networking sites such as Facebook and WhatsApp,61.70% of visually impaired responded as 'good' followed by 44.44% of speech & hearing, whereas 68.60% of locomotor impaired responded as 'excellent'.

Table 40

Level of knowledge of web-based activities—Status wise

Web based activities		Status		
	Use	Student	Teaching faculty	Other
Internet browsing	Excellent	109 (29.07)	12 (48.00)	62 (95.38)
	Good	256 (68.27)	9 (36.00)	3 (4.52)
	Average	10 (2.67)	4 (16.00)	0
	Poor	0	0	0

Web based activities		Status		
	Use	Student	Teaching faculty	Other
	Very poor	0	0	0
	Total	375	25	65
Search engines (Yahoo, Google etc.)	Excellent	2 (0.53)	10 (40.00)	62 (95.38)
	Good	304 (81.07)	11 (44.00)	3 (4.52)
	Average	69 (18.40)	4 (16.00)	0
	Poor	0	0	0
	Very poor	0	0	0
	Total	375	25	65
E-Mail (Gmail, Rediff mail etc.)	Excellent	66 (17.60)	12 (48.00)	65 (100.00)
	Good	248 (66.13)	13 (52.00)	0
	Average	59 (15.73)	0	0
	Poor	2 (0.53)	0	0
	Very poor	0	0	0
	Total	375	25	65
Web based online catalogue (Library catalogue on the internet	Excellent	14 (3.73)	2 (8.00)	0
	Good	58 (15.47)	18 (72.00)	25 (38.46)
	Average	109 (29.07)	4 (16.00)	40 (61.54)
	Poor	131 (34.93)	1 (4.00)	0
	Very poor	63 (16.80)	0	0
	Total	375	25	65
Social networking activities such as Facebook, WhatsApp etc.	Excellent	92 (24.53)	16 (64.00)	43 (66.15)
	Good	217 (57.87)	9 (36.00)	22 (33.85)
	Average	65 (17.33)	0	0
	Poor	1 (0.27)	0	0
	Very poor	0	0	0
	Total	375	25	65

(The figures in bracket indicates the respective percentage)

Status wise analysis shows 'teaching faculty and 'other' group are excellent in web-based activities such as internet browsing with a response of 29.07% and 48% students responded as good in search engines, email sending, reply resending etc. A 66.15% of 'other' group are excellent in social networking activities.

4.3.5. Familiarity of operating systems and application software

To access the information in this information society, the differently abled persons are using computers, mobile phones etc. So, the investigator here tried to understand the familiarity of operating systems and application software of these users and the responses are depicted in the following tables.

Table 41

Familiarity of operating systems

Category	Windows		Linux		Android	
	Familiar	Unfamiliar	Familiar	Unfamiliar	Familiar	Unfamiliar
Visually Impaired	235 (100)	0	235 (99.57)	0	205 (87.23)	30 (12.77)
Speech & Hearing Impaired	144 (100)	0	144	0	132 (91.67)	12 (8.33)
Locomotor Impaired	86 (100)	0	86 (100)	0	77 (89.53)	9 (10.47)

(The figures in bracket indicates the respective percentage)

The data in the Table 41 indicate that all the three categories of differently abled users under study are familiar about the Windows and Linux

operating system. There is a variation in the case of Android as only 87.23% of visually impaired are familiar followed by 91.67% of speech & hearing and 89.53 % of locomotor impaired persons.

Table 42

Familiarity of application software

Application software	Familiarity	Category		
		Visually impaired	Speech & hearing impaired	Locomotor impaired
Text processor	Familiar	235 (100)	144 (100)	86 (100)
	Unfamiliar	0	0	0
Spread sheet	Familiar	235 (100)	144 (100)	86 (100)
	Unfamiliar	0	0	0
Presentation	Familiar	10 (4.26)	135 (93.75)	86 (100)
	Unfamiliar	225 (95.74)	9 (6.25)	0
Movie/animation	Familiar	31 (13.19)	134 (93.06)	86 (100)
	Unfamiliar	204 (86.81)	10 (6.94)	0
Graphics	Familiar	5 (2.12)	127 (88.19)	77 (89.53)
	Unfamiliar	230 (97.88)	17 (11.81)	9 (10.47)

(The figures in bracket indicates the respective percentage)

Responses in the Table 42 indicates all differently abled persons under study are 'familiar' about text processor such as Word, Libre office etc and spread sheet such as Excel and Libre calc etc. Regarding presentation

software, only 4.26% of visually impaired are 'familiar' whereas 93.75% of speech & hearing and 100% of locomotor impaired are familiar with it. Response about movie/animation indicate that 86.81% of visually impaired are 'unfamiliar' with it whereas 93.06% of speech & hearing impaired and all locomotor impaired are 'familiar' with it. Response about graphics indicate that 97.88% of visually impaired are 'unfamiliar' with it whereas 88.19% of speech & hearing and 89.53% of locomotor impaired are 'familiar' with it.

4.4. Availability of Assistive technologies in institutions

Table 43

Availability of Assistive technologies

Availability	Visually impaired	Speech & hearing impaired	Locomotor impaired
Yes	235 (100)	144 (100)	86 (100)
No	0	0	0
Total	235	144	86

(The figures in bracket indicates the respective percentage)

Here the investigator asked about the availability of various assistive technologies for information support for the three categories of differently abled persons under study. The data depicted in the Table 43 showed all the categories have positive response about the availability of various assistive technologies in their institutions.

4.5. Awareness of assistive hardware for differently abled

Table 44

Awareness of assistive hardware for the visually impaired

Hardware	Aware	Not Aware
Scanner/Reader	235 (100)	0
Webcam	218 (92.77)	17 (7.23)
Voice Recorder	235 (100)	0
Braille Printer/ Embosser	235 (100)	0
Magnifier / Magnifying Glasses	235 (100)	0
Braille Computer	224 (95.32)	11 (4.68)
DAISY Player/ Angel player	235 (100)	0
Braille Slate	235 (100)	0

(The figures in bracket indicates the respective percentage)

The responses regarding the awareness of hardware facilities for the visually impaired are depicted in the Table.44 and it indicate majority of the visually impaired are aware about them and only 7.23% and 4.68% responded as not aware of webcam and braille computer.

The above analysis shows that majority of the visually impaired persons are aware of the available hardware in their institutions

Table 45
Awareness of assistive hardware for Speech and hearing Impaired

Hardware	Aware	Not aware
TTY/TDD	144 (100)	0
Portable Speech Synthesizer	144 (100)	0
Alarming devices/signal systems	144 (100)	0
Assistive Listening system	144 (100)	0
Closed captioned decoders	95 (65.97)	49 (34.03)
Hearing aids	144 (100)	0

(The figures in bracket indicates the respective percentage)

The responses of speech & hearing people in the Table 45, regarding the hardware Facilities indicate all are aware about the hardware facilities for them with a response of 100% except in the case of closed-captioned decoders, ie, 34.03% unaware of it.

Table 46
Awareness of assistive hardware for the locomotor impaired

Hardware	Aware	Not aware
Simple/ Electric Wheelchairs	86 (100)	0
Walking frames/Ramps	86 (100)	0
Adaptive furniture	86 (100)	0
Adaptive keyboards	82 (95.35)	4 (4.65)
Adaptive pointing devices	75 (87.21)	11 (12.79)
Cursor- control devices	25 (29.07)	61 (70.93)
Speech input device	28 (25.58)	58 (67.44)

(The figures in bracket indicates the respective percentage)

The data regarding the hardware facilities for locomotor in the Table 46 indicates 100% of them aware about the simple/electric wheelchairs, walking frames/ramps and adaptive furniture. 95.35% of locomotor impaired are aware of adaptive keyboards, 87.21% of adaptive pointing devices, 29.07% of cursor control devices and 25.58% aware of speech input devices.

4.6. Use of assistive hardware for differently abled

Here investigator made an attempt to study the use of hardware for differently abled persons for their information support and it was examined using a three-point scale and the results are given in the following tables by category wise.

Table 47

Use of hardware for visually impaired

Hardware	To a great extent	To a moderate extent	To a lesser extent
Scanner/Reader	84 (35.74)	151 (64.26)	0
Webcam	16 (6.81)	33 (14.04)	186 (79.15)
Voice recorder	147 (62.55)	88 (37.45)	0
Braille printer/embosser	132 (56.17)	102 (43.40)	1 (0.43)
Magnifier/magnifying glass	21 (8.94)	36 (15.32)	178 (75.74)
Braille computer	30 (12.77)	124 (52.77)	81 (34.47)
Daisy player/angel player	164 (69.79)	63 (26.81)	8 (3.40)
Braille slate	73 (31.06)	46 (19.57)	116 (49.36)

(The figures in bracket indicates the respective percentage)

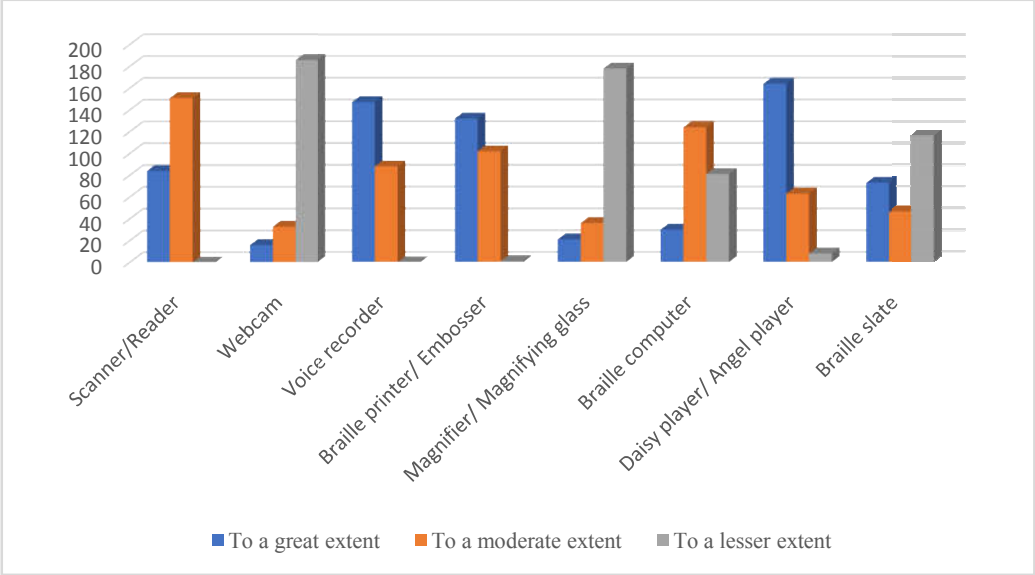

Figure. 9 Use of hardware for visually impaired

As per the Table 47 and figure 9, 69.79% of the visually impaired are using daisy player/angel player to a great extent followed by the voice recorder (62.55%), where as 64.26% visually impaired responded as the use of scanner/reader to a moderate extent. 56.17% responded as the use of braille printer /embosser to a great extent. Webcam and magnifier glass have a lesser extent of use with a response of 79.15% and magnifier/magnifying glass respectively.

Table 48

Use of hardware for speech & hearing impaired

Hardware	To a great extent	To a moderate extent	To a lesser extent
TTY/TDD	37 (25.69)	74 (51.39)	33 (22.92)
Portable Speech Synthesizer	50 (34.72)	79 (54.86)	15 (10.42)
Alarming devices /signal systems	110 (76.39)	28 (19.44)	6 (4.17)
Assistive Listening system	73 (50.69)	71 (49.31)	0
Closed captioned decoders	4 (2.78)	14 (9.72)	126 (87.50)
Hearing aids	113 (78.47)	31 (21.53)	0

(The figures in bracket indicates the respective percentage)

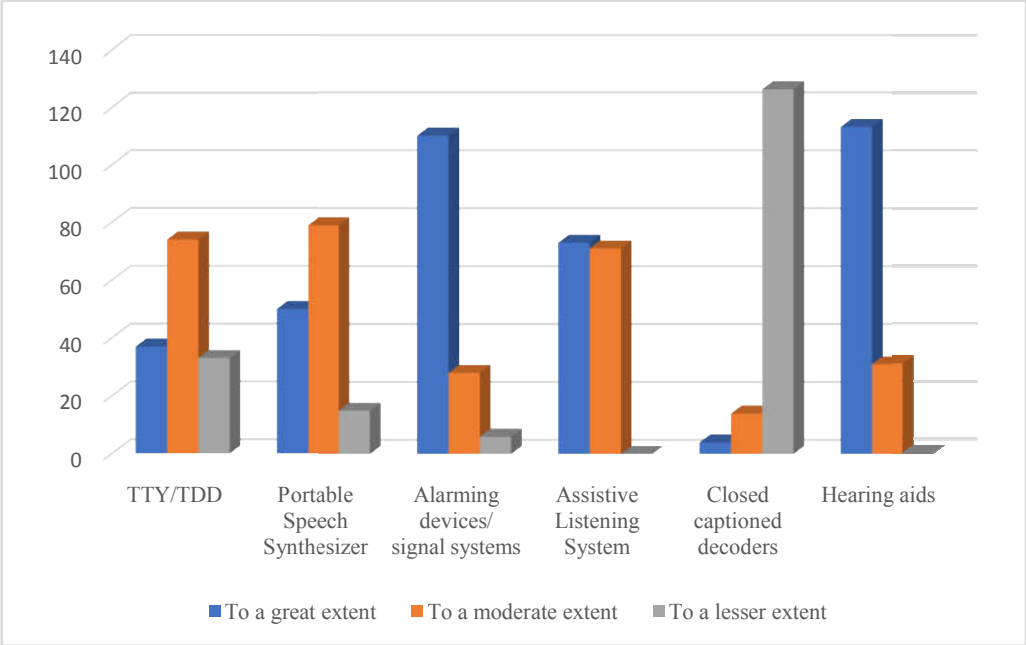

Figure.10 Use of hardware for speech & hearing impaired

The Table 48 and figure 10 indicate the use of hardware for speech & hearing impaired, which shows a great extent of use of alarming devices/signal systems and hearing aids with a response of 76.39% and 78.47% respectively. Text telephone device and portable speech synthesizer have a moderate extent of use by 51.39% and 54.86% speech & hearing people.

Table 49

Use of hardware for locomotor impaired

Hardware	To a great extent	To a moderate extent	To a lesser extent
Simple/ Electric Wheelchairs	81 (94.19)	5 (5.81)	0
Walking frames/Ramps	81 (94.19)	5 (5.81)	0
Adaptive Keyboards	3 (3.49)	72 (83.72)	11 (12.79)
Adaptive pointing devices	1 (1.16)	36 (41.86)	49 (56.89)
Cursor- control devices	9 (10.47)	28 (32.56)	49 (56.89)
Speech input device	3 (3.49)	24 (27.91)	59 (68.60)

(The figures in bracket indicates the respective percentage)

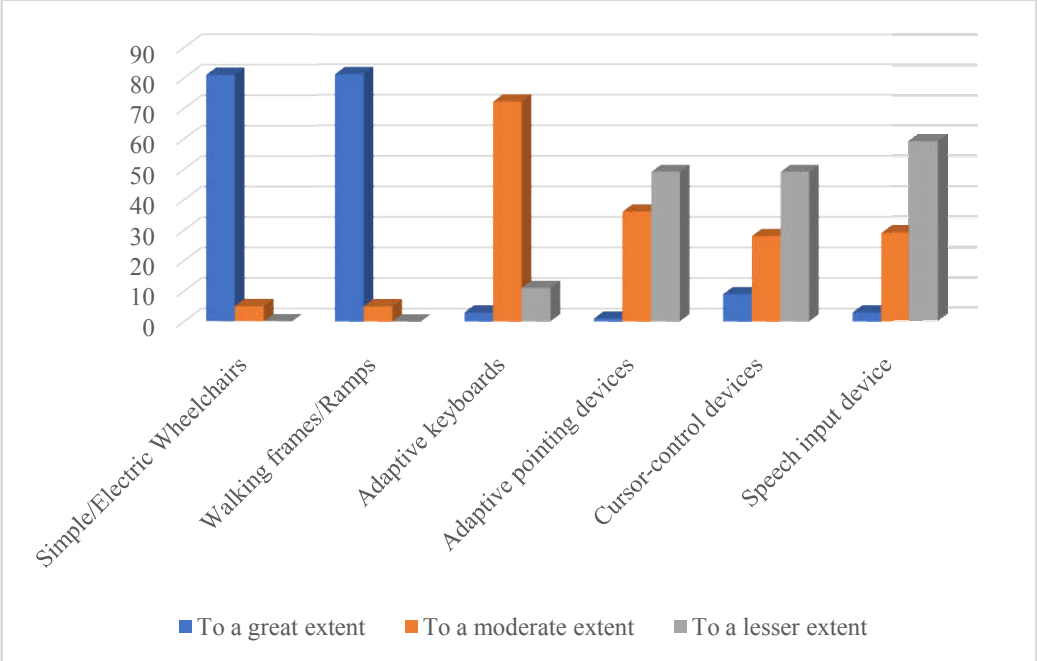

Figure 11.Use of hardware by locomotor impaired

The response in the Table 49 and figure 11 indicate walking frames/ ramps, and simple/electric wheel chairs used to a great extent with equal response of 94.19% whereas 'adaptive keyboards' used to a moderate extend with a response of 83.72%. But the adaptive devices, cursor control devices and speech input device used to a lesser extent.

4.7 Awareness of assistive software/information system for differently abled persons.

Like hardware facilities for the differently abled, Assistive software also in various institutions to provide the information support. So, the investigator tried to understand the awareness about this software among the differently abled persons.

Table 50

Awareness of assistive software for Visually impaired

Software	Aware	Not aware
JAWS	235 (100)	0
NVDA	233 (99.15)	2 (0.85)
Orca	235 (100)	0
FS Reader	222 (94.47)	13 (5.53)
Kurzweil	235 (100)	0
LIOS	210 (89.36)	25 (10.64)
Zoom Text Magnifier	233 (99.15)	2 (0.85)
Screen Enlargement Software	171 (72.77)	64 (27.73)
Duxbury Software	197 (83.83)	38 (16.17)
DAISY	235 (100)	0

(The figures in bracket indicates the respective percentage)

Table 50 represents the data about the awareness of assistive software with a cen percent response of 'aware' about JAWS, Kurzweil, Orca and Daisy followed by NVDA and zoom text magnifier with 99.15% whereas 94.47% visually impaired aware of FS Reader and 89.36% of visually impaired aware of LIOS.

Table 51

Awareness of assistive software for speech and hearing impaired

Software	Aware	Not aware
TTY Emulating Software	127 (88.19)	17 (11.81)
Dragon Dictate (Convert speech to text)	96 (66.67)	48 (33.33)
Big Mac (Picture Software)	139 (96.53)	5 (3.47)
Video Captioning Software	144 (100)	0
Skype	144 (100)	0

(The figures in bracket indicates the respective percentage)

In Table 51, responses regarding the software, 100% of speech & hearing persons are of aware of Skype and video captioning software. Whereas 96.53% response of Big mac, followed by the TTY emulating software' with 88.19% of 'awareness'. 66.67% of speech & hearing are aware about dragon dictate, but 33.33% not.

Table 52

Awareness of assistive software for locomotor impaired

Software	Aware	Not aware
Dragon naturally speaking	66 (76.74)	20 (23.26)
Voice recognition Software	73 (84.88)	13 (15.12)
On- Screen Board	86 (100)	0
Word Prediction Completion	47 (54.65)	39 (45.35)

In Table 52, 100% of locomotor impaired responded 'aware' about 'on screen board', followed by voice recognition software (84.88%) and dragon naturally speaking (76.74%).

4.8 Use ofassistive software/information system for differently abled persons.

Table 53

Use of assistive software for Visually impaired

Software	To a great extent	To a moderate extent	To a lesser extent
JAWS	226 (96.17)	8 (3.40)	1 (0.43)
NVDA	64 (27.23)	119 (50.64)	52 (79.15)
Orca	10 (4.26)	39 (16.60)	186 (79.15)
FS Reader	42 (17.87)	139 (59.15)	54 (22.98)
Kurzweil	105 (44.68)	126 (53.62)	4 (1.70)
LIOS	32 (13.62)	66 (28.09)	137 (58.30)
Zoom Text Magnifier	25 (10.64)	62 (26.38)	148 (62.98)
Screen Enlargement Software	40 (17.02)	70 (29.79)	125 (53.19)
Duxbury Software	57 (24.26)	63 (26.81)	115 (48.94)
DAISY	117 (49.79)	80 (34.04)	38 (16.17)

(The figures in bracket indicates the respective percentage)

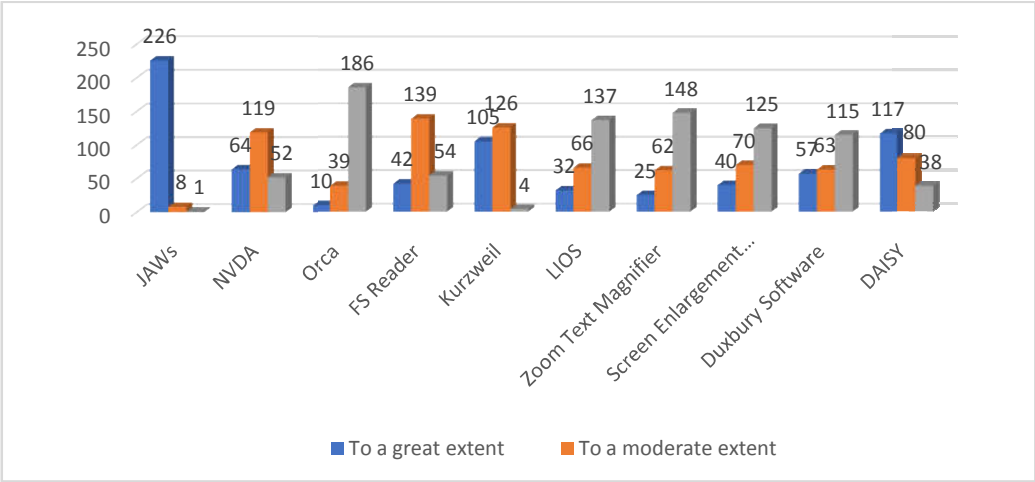

Figure 12 Use of software for visually impaired

As per the Table 53, among the visually impaired 96.7%, using 'JAWS' to a great extent, followed by DAISY (49.79%) and Kurzweil (44.68%). 59.15% of visually impaired using 'FS Reader' to a moderate extent.50.64% of visually impaired using 'NVDA' to a moderate extent.

Table 54

Use of assistive software for speech and hearing impaired

Software	To a great extent	To a moderate extent	To a lesser extent
TTY Emulating Software	85 (59.03)	49 (34.03)	10 (6.94)
Dragon Dictate (Convert speech to text)	56 (38.89)	49 (34.03)	39 (27.08)
Big Mac (Picture Software)	77 (53.47)	61 (42.36)	6 (4.17)
Video Captioning Software	102 (70.83)	31 (21.53)	11 (13.19)
Skype	105 (72.92)	39 (27.08)	0

(The figures in bracket indicates the respective percentage)

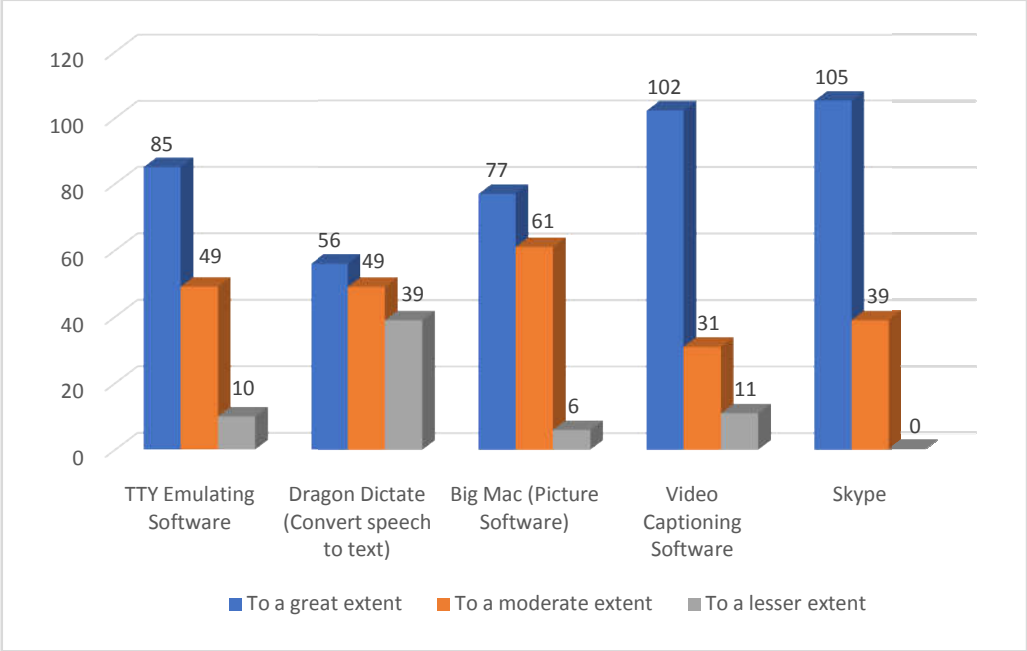

Figure 13 Software for Speech and Hearing Impaired - Use

As per the Table 54, 'Skype' and 'Video captioning software' is used to 'a great extent' with a response of 72.92% and &0.83% respectively by the speech & hearing impaired people. TTY emulating software is used to a great extent with a response of 59.03%. The picture software 'Big Mac' used with a response of 53.47% to a great extent.

Table 55

Use of assistive software for locomotor impaired

Software	To a great extent	To a moderate extent	To a lesser extent
Dragon naturally speaking	5 (5.81)	17 (19.77)	64 (74.42)
Voice recognition Software	16 (18.60)	33 (38.37)	37 (43.02)
On- Screen Board	5 (5.81)	35 (40.70)	46 (53.49)
Word Prediction Completion	25 (29.07)	31 (36.05)	30 (34.88)

(The figures in bracket indicates the respective percentage)

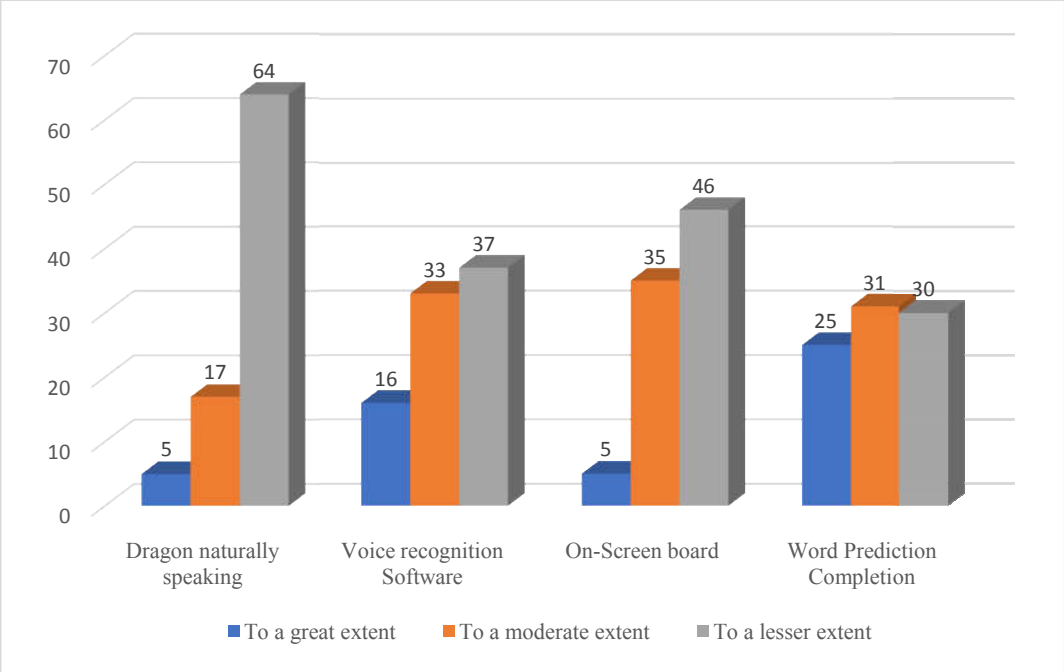

Figure 14 Use of software by locomotor impaired

In the case of locomotor impaired, 40.70% are using on screen board to a moderate extend, followed by voice recognition software (38.37%) and word prediction completion (36.05%).

4.9. Opinion on use of assistive technologies in various institutions

Table 56

Use of assistive technologies

Category	Opinion					Sample Total
	Excellent	Good	Average	Bad	Not at all	
Visually Impaired	58 (24.68)	168 (71.49)	9 (3.83)	0	0	235
Speech & Hearing Impaired	30 (20.83)	110 (76.39)	4 (2.78)	0	0	144
Locomotor Impaired	0	40 (46.51)	46 (53.49)	0	0	86
	TOTAL					**465**

(The figures in bracket indicates the respective percentage)

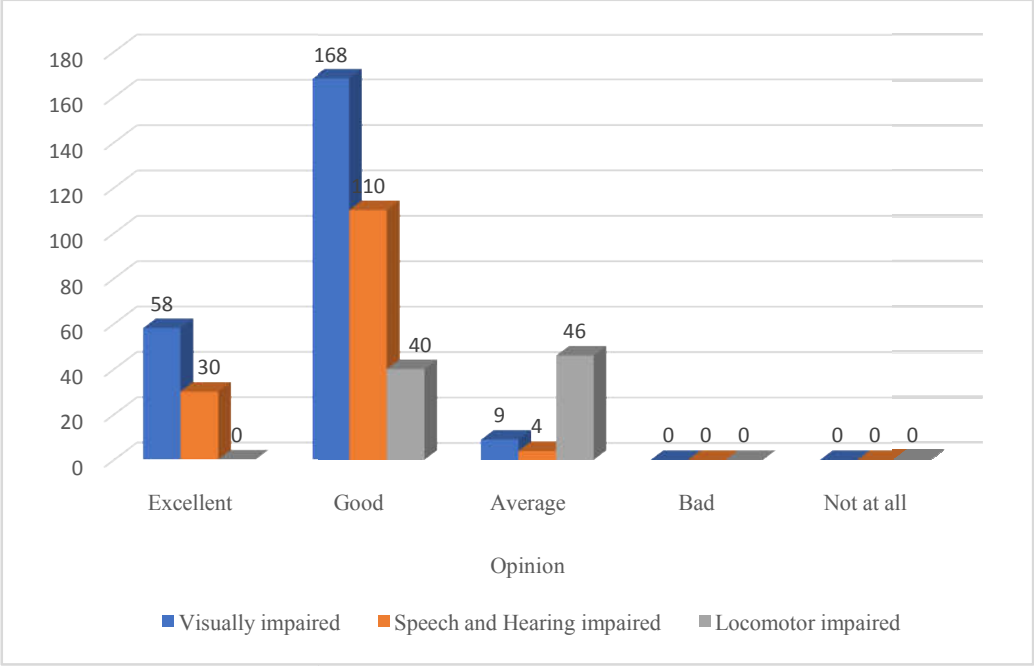

Figure 15 Opinion of use of assistive technologies

As per the Table 56 and Figure 15, majority of the two categories under study responded as 'good' as 71.49 % of visually impaired, 76.39% of speech & hearing impaired persons in their institutions whereas 46.5% of locomotor impaired responded as 'good'. Almost equal percentage of visually impaired and speech & hearing impaired responded as 'excellent' with a response of 24.68% and 20.83% respectively. 53.49% of locomotor impaired are responded as 'average'.

4.10 Opinion about the assistive software and hardware

Table 57

Opinion about the assistive software for visually impaired

Software	Fully Satisfied	Satisfied	Not Satisfied
JAWS	79 (33.62)	145 (61.70)	11 (4.68)
NVDA	67 (28.51)	145 (61.70)	23 (9.79)
Orca	50 (21.28)	176 (74.89)	9 (3.82)
FS Reader	53 (22.55)	171 (72.77)	11 (4.68)
Duxbury	43 (18.30)	181 (77.02)	11 (4.68)
DAISY	49 (20.85)	153 (65.12)	33 (14.04)
ZoomText magnifier	64 (27.23)	142 (60.43)	29 (12.34)
Kurzweil	78 (33.19)	129 (54.89)	28 (11.91)
LIOS	71 (30.21)	111 (47.23)	53 (22.55)

(The figures in bracket indicates the respective percentage)

As per Table 57, it is found that among the visually impaired users 'JAWS' is the fully satisfied software with a response rate of 33.62% followed by Kurzweil (33.19 %) and LIOS (30.21%). Orca, FS Reader and DAISY satisfied software for the visually impaired users, whereas LIOS is not satisfied with a response rate of 22.55%.

Table 58

Opinion about the software for speech & hearing impaired

Software	Fully Satisfied	Satisfied	Not Satisfied
TTY emulating software	71 (49.31)	63 (43.75)	10 (6.94)
Dragon Dictate	33 (22.92)	81 (56.25)	30 (20.83)
Big Mac	53 (36.81)	61 (42.36)	21 (14.58)
Video Captioning software	60 (41.67)	49 (34.03)	35 (24.31)
Skype	47 (32.64)	84 (58.33)	13 (9.03)
Other (conventional)	73 (50.69)	59 (40.97)	12 (8.33)

(The figures in bracket indicates the respective percentage)

Data in the Table 58 depicted that the fully satisfied software is the TTY emulating software with a response rate of 49.31%, but 50.69% responds shows that they prefer other technology, ie; conventional technology sign language. Skype video is the satisfied software among the speech and hearing impaired people followed by Big Mac software.

Table 59

Opinion about the software for locomotor impaired

Software	Fully satisfied	Satisfied	Not
Dragon naturally Speaking	30 (34.88)	49 (56.98)	7 (8.14)
Voice recognition Software	27 (31.40)	48 (55.81)	11 (12.79)
On screen board	41 (47.67)	31 (36.05)	14 (16.28)
Word prediction completion	21 (24.42)	45 (52.33)	20 (23.26)

(The figures in bracket indicates the respective percentage)

As per the Table. 59, the 'On screen board' is the fully satisfied softwareamong the locomotor impaired people with a response rate of 47.67%. Dragonnaturally Speaking and Voice recognition software is the satisfied software among the Locomotor impaired.

Table 60

Opinion about the hardware for visually impaired

Hardware	Fully Satisfied	Satisfied	Not Satisfied
Scanner / Reader	73 (50.69)	117 (81.25)	21 (14.58)
Braille Printer/Embosser	61 (42.36)	71 (49.31)	12 (8.33)
DAISY Player/Angel Player	71 (49.31)	57 (39.58)	16 (11.11)
Braille Slate/Braille Computer	43 (29.86)	92 (63.88)	9 (6.25)

As per the Table 60, 81.25% of Visually Impaired are 'satisfied' with scanner/Reader, whereas 50.69% are 'fully satisfied' with it. In the case of Braille Printer/Embosser 54.89% 'Satisfied' with it, whereas 48.09% of Visually Impaired are 'satisfied' with DAISY Player/Angel Player. 47.66% of Visually Impaired are 'fully satisfied' with Braille Slate/Braille Computer.

Table 61

Opinion about the hardware for speech and hearing impaired

Hardware	Fully Satisfied	Satisfied	Not Satisfied
TTY/TDD	101 (42.98)	121 (51.49)	25 (10.64)
Assistive Listening system	89 (37.87)	123 (52.34)	23 (9.79)
Closed captioned decoder	85 (36.17)	123 (52.34)	27 (11.49)

(The figures in bracket indicates the respective percentage)

As per Table no.61, 51.49% of Speech and hearing impairedpeople are 'satisfied' with TTY/TDD but 42.98% are 'fully satisfied' with it. In the case of Assistive listening system 52.34% are 'satisfied' with it. 52.34% of Speech and hearing impaired are 'satisfied' with Closed captioned decoder, whereas 36.17% are 'fully satisfied' with it.

Table 62

Opinion about the hardware for locomotor impaired

Hardware	Fully Satisfied	Satisfied	Not Satisfied
Electric Wheelchair	29 (33.72)	56 (65.12)	1 (1.16)
Adaptive furniture/Walking frames/Ramps	33 (38.37)	43 (50)	10 (11.63)
Adaptive Keyboards	21 (24.42)	64 (74.42)	1 (1.16)

(The figures in bracket indicates the respective percentage)

In the case of Electric Wheelchairs 65.12% of Locomotor Impaired are 'satisfied' and 33.72% are 'fully satisfied', 50% of Locomotor Impaired are 'satisfied' with Adaptive furniture/Walking frames/Ramps whereas 38.37 'fully satisfied' with it. 24.42% are 'fully satisfied' with Adaptive Keyboards whereas 74.42 are 'satisfied' with it.

4.11 Preference of assistive technology as effective for information support

Here investigator seek responses about which assistive hardware and assistive software is effective for their information support.

4.11.1. Preference of assistive hardware for visually impaired

Table 63

Preference of hardware for visually impaired

Hardware	Weighted Mean	Rank
Scanner/Reader	5.99	3
Webcam	1.22	6
Voice recorder	8.79	1
Braille printer/embosser	4.76	4
Magnifier/magnifying glass	0.22	7
Braille computer	2.94	5
Daisy player/angel player	8.30	2

(The figures in bracket indicates the respective percentage)

Weighted mean value shows the preference in the Table. 63 and 'voice recorder' is their first preference with a weighted mean value of (8.79). Second preference to 'Daisy player/Angel player' with a weighted mean value of (8.30) followed by Scanner/reader with a weighted mean value of (5.99) and it comes the third preference of visually impaired persons.

4.11.2 Preference of assistive hardware for speech & hearing impaired

Table 64

Preference of assistive hardware for speech & hearing impaired

Hardware	Weighted Mean	Rank
TTY/TDD	13.25	2
Portable Speech Synthesizer	16.04	1
Alarming devices /signal systems	8.79	4
Assistive Listening system	7.69	5
Closed captioned decoders	3.16	6
Hearing aids	10.75	3

(The figures in bracket indicates the respective percentage)

From the Table 64, it is clear the Portable speech synthesizer have the first preference with a weighted mean of (16.04). It followed by the Text telephone devices with a mean value of (13.25), which forms the second preference and Hearing aids (10.75) is the third preference.

4.11.3. Preference of assistive hardware for locomotor impaired

Table 65

Preference of assistive hardware for locomotor impaired

Hardware	Weighted Mean	Rank
Simple/ Electric Wheelchairs	2.96	1
Walking frames/Ramps	2.57	2
Adaptive Keyboards	0.59	3
Adaptive pointing devices	.00	
Cursor- control devices	.00	
Speech input device	.00	

The most preferred hardware by the locomotor impaired are simple/electric wheelchairs with a weighted mean value of (2.96) followed by walking frames/ramps (2.57). the third preference is to the adaptive keyboards by these locomotor impaired persons.

4.11.4. Preference of assistive software for the visually impaired.

Table 66

Preferenceof assistive software for visually impaired

Software	Weighted mean	Rank
JAWS	5.83	1
NVDA	4.27	2
Orca	3.34	5
FS Reader	2.13	6
Kurzweil	4.22	3
LIOS	1.06	7
Zoom Text Magnifier	0.26	8
Screen Enlargement Software	0.24	9
Duxbury Software	0.12	10
DAISY	4.10	4

(The figures in bracket indicates the respective percentage)

From the table 66, it is evident that visually impaired has the first preference to JAWS with a weighted mean of (5.83). Second preference to the NVDA (4.27), followed by the Kurzweil (4.22) and DASIY (4.10), Orca has a fifth preference with a weighted mean of (3.34).

4.11.5 Preference of assistive software for the speech & hearing impaired

Table 67

Preference of assistive software for speech and hearing impaired

Software	Weighted mean	Rank
TTY emulating software	8.36	1
Dragon Dictate (Convert speech to text)	3.76	5
Big Mac (Picture software)	2.16	6
Video captioning software	6.92	3
Skype video	5.43	4
Other	7.90	2

(The figures in bracket indicates the respective percentage)

From the Table, 67 it is clear that TTY emulating software with weighted mean value of 8.36 comes first preference for the use of assistive technology for the locomotor impaired. The respondents with 'other' is having a weighted mean value of (7.90) comes as the second preference, which is the conventional technology, i.e., sign language. Video captioning software is the next place which they prefer in their information support.

4.11.6 Preference of assistive software for locomotor impaired

Table 68

Preference of assistive software for locomotor impaired

Software	Weighted Mean	Rank
Dragon naturally speaking	2.12	2
Voice recognition software	1.92	3
On screen board	5.87	1
Word prediction completion	0.01	

From Table 68, it is found that locomotor impaired give first preference to 'on screen board' with a weighted mean value of (5.87) followed by 'dragon naturally speaking' and 'voice recognition software'.

4.12. Use of Mobile Apps

Now a days everyone has mobile phones with them. So, the investigator tried to get a clear picture of using mobile apps here.

Table 69

Use of Mobile Apps

Availability	Visually impaired	Speech & hearing impaired	Locomotor impaired
Yes	235 (100)	144 (100)	75 (87.21)
No	0	0	11 (12.79)
Total	235	144	86

(The figures in bracket indicates the respective percentage)

Data in the Table 69 indicates that Cen percentage of visually impaired and speech & hearing impaired are using one or another mobile app. In the case of locomotor impaired, 87.21% responded about using of mobile apps whereas 12.79 % not using it.

4.12.1 Types of mobile apps using

Table 70

Type of mobile apps

Mobile Apps	Category		
	Visually Impaired	**Speech & Hearing impaired**	**Locomotor impaired**
Talkback	199 (84.69)	0	0
Scanlife barcode & QR Code	8 (3.40)	102 (70.83)	0
Magnify	2 (0.85)	135 (93.75)	25 (29.06)
Nearby explorer (navigating aid to travel)	0	0	32 (37.20)
Walky talky	0	0	0
Google voice typing	120 ((51.06)	0	25 (29.06)
Go Read	25 (10.63)	0	20 (23.25)
Easy Reader	2 (0.85)	0	0
Total	235	144	86

(The figures in bracket indicates the respective percentage)

From the Table 70, it is clear that differently abled persons are also using mobile apps for their information support for daily living etc, among that, 84.69% of visually impaired persons are using 'Talkback' followed by 'Google voice typing' with 51.06%. Only a small percentage, 10.63% are using 'Go Read' mobile app. Speech & hearing impaired persons are a good

user of mobile app such as 'scan life' & 'magnify' with 70.83% and 93.75% respectively. Locomotor impaired persons are using 'Nearby explorer' 'google voice typing' with a response rate of 37.20% and 29.06% respectively.

The total response exceeds100% because of the respondents were allowed multiple choice answering.

4.13 Satisfaction level of assistive technologies for differently abled users

Table 71

Satisfaction of assistive technology-Category wise

Category	Satisfactory level			
	Fully Satisfied	**Satisfied**	**Not Satisfied**	**Total**
Visually impaired	39 (16.60)	189 (80.43)	7 (2.97)	235
Speech & hearing impaired	53 (36.81)	87 (60.41)	4 (2.78)	144
Locomotor impaired	35 (40.70)	49 (56.18)	2 (2.33)	86
Sample Total	127	325	13	465

Chi =28 df =4 P=0.000

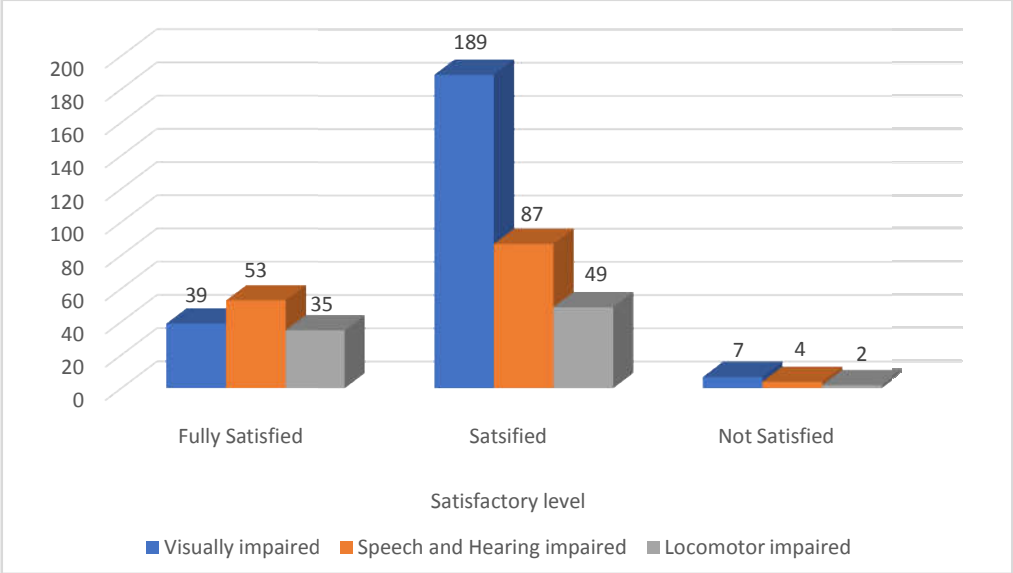

Figure 16 Satisfaction of assistive technology-Category wise

To know about the satisfactory level of differently abled persons towards the various assistive technologies, investigator seek responses and from the Table 68 and figure 16, it is evident that 83.43% of visually impaired persons are 'satisfied' with it whereas only 16.60 % are 'fully satisfied' with it. In the case of speech & hearing impaired persons, 36.81% are 'fully satisfied' whereas 60.41% are 'satisfied' with the various assistive technologies provided in the institutions. As per the response of locomotor impaired, 56.18% are 'satisfied' whereas 40.70% are 'fully satisfied'. Only 2.33% of locomotor impaired have a response of 'not satisfied'

As per the Chi square test results of Table 71, there exists significant difference in the satisfaction level about assistive technology among differently abled persons regarding their category as the P value is zero.

Table 72

Satisfaction of assistive technology-Status wise

Status	Satisfactory level			
	Fully Satisfied	**Satisfied**	**Not Satisfied**	**Total**
Students	105 (28)	262 (69.87)	8 (2.13)	375
Teaching Faculty	5 (20)	19 (76)	1 (4)	25
Others	17 (26.15)	44 (67.70)	4 (6.15)	65
Total	127	325	13	465

Chi = 4.10 df = 4 P = 0.392

The status wise analysis shows that 69.87% students are satisfied with the available assistive technologies proving in the institutions, followed by the 80% of the teaching faculty and 67.70% of persons in the other group.

The chi square value indicates satisfaction level about the assistive technologies among differently abled persons is not statistically significant based on their status as the P value is greater than 0.05.

Table 73

Satisfaction of assistive technology- Institution wise

Institutions	Satisfactory level			Total
	Fully Satisfied	Satisfied	Not Satisfied	
Libraries	20 (12.90)	130 (83.87)	5 (3.23)	155
NGOs	25 (22.58)	117 (75.48)	3 (1.94)	155
Special centres	72 (46.45)	78 (50.32)	5 (3.23)	155
Aggregate	137	325	13	

Chi – 48 df-4 P=0.000

As per the data in the table 73, It is found that the differently abled users are fully satisfied with the assistive technologies provided by the special centres followed by NGOs and schools.

As per the Chi square test results of Table 73, there exists significant difference in the satisfaction level about assistive technology among differently abled persons regarding their category as the P value is zero.

4.14 Barriers in using assistive technologies

There may be barriers or hindrances while using information in the case of all persons, same may be in the case of differently abled. So, the investigator tried to find out the barriers while these people face during the usage of assistive technology.

Table 74

Barriers in using the assistive technologies

Barriers	Category				
	Visually Impaired	Speech & hearing impaired	Locomotor impaired	Weighted Mean	Rank
Both staff and users must be trained	0.86	0.54	0.33	0.58	4
Lack of sufficient assistive technology facilities	1.05	0.67	0.38	0.70	2
Lack of user involvement in their device selection	0.79	0.54	0.28	0.54	6
Negative societal view towards differently abled	0.71	0.45	0.26	0.47	7
Technological problems related to connectivity	0.62	0.41	0.21	0.41	8
Lack of proper infrastructure	1.13	0.69	0.40	0.74	1
Lack of ICT skill among users	1.00	0.55	0.36	0.64	3
Lack of policy	0.96	0.59	0.35	0.64	3
Personal attention not provided in order to reduce the non-use of devices	0.83	0.51	0.31	0.55	5
Poor fund, i.e., limited economic resources	0.42	0.32	0.19	0.31	9
Being an information illiterate or technologically illiterate	0.21	0.19	0.17	0.19	10
In accessibility of lab/rest rooms	0.03	0.06	0	0.03	11
Lack of proper support from staff	0.01	0.01	0	0.01	12
Lack of interpersonal Skill for working for Differently abled	0	0	0	0	0

(The figures in bracket indicates the respective percentage)

The overall data depicted in the table 74, indicate that 'lack of proper infrastructure' with a weighted mean value of 0.74, and it is the major problem faced by these categories of users. It is followed by the 'lack of sufficient assistive technology facilities' (0.70). Lack of institutional policies and lack of ICT skill among the users have the same weighted mean value (0.64) and forms the third main problem faced by them. 'Both staff and users must be trained' comes the fourth barrier, then comes the personal attention should provide in order to reduce the non-use of devices. These followed by lack of user involvement in their device selection, negative societal view towards the differently abled, technological problems related to connectivity etc.

4.15 Conclusion

Analysis showed that differently abled persons shows varying level of use of assistive technologies for their information support. As the use of assistive technology is greatest among the differently abled persons, more access features should be provided in all institutions. This chapter analyses the data collected from the users of various institutions through questionnaires and statistical techniques like simple percentage method, weighted mean, chi square etc. The results are explained with the help of tables and diagrams, which helps to reach into the findings of the study.

5.1 Introduction

The present study is intended to analyse awareness and use of assistive technologies for information support for differently abled persons in Kerala , this chapter deals with the major findings of the study in a summarised form and put forward suggestions and recommendations for the improvement of information services to these differently abled persons, thus this last chapter of the research report presents the findings of the study, tenability of hypothesis, suggestions for improvement and suggestion for further research.

5.2 Findings of the Study

After the analysis and interpretation of data it was able to draw certain findings and it is presented in the following sub headings;

5.2.1 Facilities/ Provisions and services provided.

1. Majority of the Institutions are in Rural area, i.e., 68.09 per cent of visually impaired persons opined about the geographical location of the institution are from rural area. Likewise, 93.6 per cent of the speech and hearing impaired persons, 74.42 per cent of locomotor impaired also obtaining information from rural area. Only 31.91 per cent Visually impaired persons, 6.94 per cent speech and hearing impaired and 25.58 per cent locomotor impaired are approaching institutions in the rural area.

2. The status (Type of users) shows that 74.4 per cent of students, 88 per cent of teaching faculty, 87.69 per cent of others are from rural area. Only 25.6 per cent of students 12 per cent of teaching faculty and 12.31 pe cent of other are from urban area.

3. The category wise analysis of users in the 3 types of institutions shows a major number of i.e., 58.06 per cent Visually impaired are form NGOs. Special centres are a representation of 48.3 per cent of visually impaired, whereas in the case of speech and hearing impaired persons, 44.52 per cent are from libraries. Almost equal representation of speech and hearing people in NGOs and special centres i.e, 22.58 per cent and 25.81 per cent. Locomotor impaired have comparatively smaller representation as 10.32 per cent in libraries, 19.35 per cent in NGOs and 25.80 per cent in special centres.

4. Student group in libraries and special centres forms major users with a representation of 39.73 per cent and 37.60 per cent respectively, whereas 60 per cent of teaching faculty are the good users of NGOs. The other group also depend on special centres with a representation of 23.07 per cent for their information support.

5. Majority of visually impaired persons responded that location of institution is in convenient place whereas 13.19 per cent of visually impaired opined that it is not in a convenient place. 91.7 per cent of

speech and hearing and 82.56 per cent of locomotor have the positive opinion about the place of institution but 8.3 per cent of speech and hearing and 17.44 per cent of locomotor impaired responded as not in a convenient place.

6. Regarding the entrance/doors of institution majority of the differently abled persons opined positive while 5.53 per cent of visually impaired 6.25 per cent of speech and hearing impaired and 6.98 per cent of locomotor impaired opined that there is no such a clear entrance/ opening.

7. 89.36 per cent of the visually impaired responded positively about the ramps/elevators followed by the 90.97 per cent of speech and hearing impaired and 81.4 per cent of locomotor impaired.

8. In some portions inside the institutions, there is no ramp or life and such responses from a smaller group of visually impaired, speech and hearing and locomotor impaired persons.

9. All the 3 categories of differently abled persons under study responded positively regarding seating, lighting and ventilation inside the institution.

10. Regarding how frequent these users are visiting the institutions for their information support as responded as 56.6 per cent of the visually

impaired 77.08 per cent of speech and hearing and 82.56 per cent of locomotor impaired are daily visitors to these institutions. 27.66 per cent of the visually impaired, 19.44 per cent of the speech and hearing and 13.95 per cent of the locomotor impaired visits the institution in alternate days. Only a small number of visually impaired and the speech and hearing visits these institutions twice in a week.

11. The response in the table 14 shows that daily visiting respondents are more in number than other numbers. So, these institutions should make necessary provision of assistive technologies to attract more users to these institutions in order to satisfy their information need.

12. Status (Type of users) wise analysis shows that students are the most vibrant users of these institution for their information needs. A majority of other group visit the institution only in once in week.

13. Regarding the time spending in these institutions, majority of the visually impaired users spent one to five hours, whereas a smaller number of these three categories spent more than five hours.

14. It is found that a good number of teaching faculty spend the time in these institutions more than five hour, whereas majority of other groups spend one to five hours in these institutions. The analysis shows a difference in the time spent and the status of users.

15. With regard to the purpose of visit of users the mean value of visually impaired (6.53), speech and hearing impaired (4) and locomotor (2.39) gives the first preference to the educational information. The second preference of these categories are employment information and third preference is to collect up to date information.

16. All the three categories under study depend on trained staff to locate the information they want. They are also obtaining information as directly from the resources and also with the help of friends.

17. Various institutions under study provide various information sources from conventional to advance for all categories under study. Almost all of the visually impaired persons opined that the availability of DAISY Books and Audio Books in the institutions they are approaching for their information support.60 per cents opined about the availability of Braille Books, 52.77 per cents responded about the availability of video products with Voice Clips.

18. All the speech & hearing categories responded about the availability of Text Telephone Devices and video products with captioning.

19. 91.86 per cent Loco motor impaired persons responded about the availabilityof audio books and printed documents.

20. In the Status wise response of availability of information sources 100 per cent of the teaching faculty opined about the availability of DAISY Books and Audio Books.64.27 per cent of Audio Books 46.93 per cent of Daisy Books,24.53 per cent of student group about the availability of it.

5.2.2 Use of general information sources by differently abled

21 Majority of the Visually impaired persons using Audio Books followed by Daisy Books and Braille Books.

22. All Speech and Hearing impaired persons are using Text Telephone Device whereas only a small number of Speech and Hearing persons using media products with captioning.

23. Loco motor impaired users are able to use printed documents and audio books.

24. Majority of the students groups are using audio books, Daisybooks, Braille etc.

All the teaching faculty are using Daisy books while video products with voice scripts are used up to 96.4 per cent.

5.2.3 Computer literacy and ICT skills

25. Majority of the differently abled persons have medium knowledge level. Only 9 per cent responded as good in knowledge level of computer.

26. Chi square test denotes there exist significant relation between status and knowledge level of computer of differently abled people.

27. A major number of differently abled persons are acquired knowledge by undergoing computer courses. Higher response about it acquired from 'other' mode which includes computer training provided in the institutions, online tutorials etc.

28. Mode of acquisition of computer knowledge by 'teaching faculty' and other group by self learning is higher than that of student group.

5.2.4 Use of ICT based information resources

29. Regarding the use of ICT based tools/devices, almost all the three categories of differently abled are opined positively about its usage.

30. Status wise analysis shows that there is a good usage of these devices by 'teaching faculty' and other.

31. Majority of the visually impaired and 91.86 per cent of the locomotor impaired responded as good in using the desktop computer, but 60.42

per cent of the speech & hearing responded as excellent. Likewise, all other gadgets are using in one way or another way.

32. A 100 per cent use by other group regarding the desktop computer, laptop computer etc. A high range of mobile phone usage, printer and scanner etc are among the other group.

33. Regarding ICT based activities, 71 per cent of visually impaired, 56.28 per cent of speech & hearing impaired and 66.28 per cent of locomotor are 'good' in data entry whereas, regarding pendrive copying, 46.8 per cent of visually impaired represented as 'average' whereas playing computer games have not a high relevance according to visually impaired, which showed an average response,

34 Status wise analysis showed that in data entry teaching faculty, excellent with 28 per cent and students with 27.47 per cent respectively.

35, Regarding web based activities, such as internet browsing etc, 'teaching faculty and 'other' group are excellent.

36. All the three categories under study are familiar with Windows andLinux operating system.

37. There is a variation in the case of Android as only 87.23 per cent of visually impaired are familiar followed by 91.67 per cent of speech & hearing and 89.53 per cent of locomotor impaired persons.

38. All differently abled persons under study are 'familiar' about text processor such as Word, Libre office etc and spread sheet such as Excel and Libre calc etc.

39. Regarding presentation software, only 4.26% of visually impaired are 'familiar' whereas 93.75% of speech & hearing and 100 per cent of locomotor impaired are familiar with it.

40. Response about movie/animation indicate that 86.81 per cent of visually impaired are 'unfamiliar' with it whereas 93.06 per cent of speech & hearing impaired and all locomotor impaired are 'familiar' with it.

41. Response about graphics indicate that 97.88 per cent of visually impaired are 'unfamiliar' with it whereas 88.19 per cent of speech & hearing and 89.53 per cent of locomotor impaired are 'familiar' with it.

5.2.5 Availability of assistive technologies in the institutions

42. All the categories have positive response about the availability of various assistive technologies in their institutions.

5.2.6 Awareness of assistive technologies in the institutions

43. Majority of the visually impaired are aware about assistive hardware and only 7.23 per cent and 4.68 per cent responded as not aware of webcam and braille computer.

44. Regarding the hardware Facilities indicate all are aware about the hardware facilities for them with a response of 100per cent except in the case of closed captioned decoders, ie, 34.03 per cent unaware of it.

45. 100 per cent of them aware about the simple/electric wheelchairs, walking frames/ramps and adaptive furniture. 95.35 per cent of locomotor impaired are aware of adaptive keyboards, 87.21 per cent of adaptive pointing devices, 29.07 per cent of cursor control devices and 25.58 per cent aware of speech input devices.

5.2.7 Use of assistive hardware

46. 69.79 per cent of the visually impaired are using daisy player/angel player to a great extent followed by the voice recorder (62.55 per cent), whereas 64.26 per cent visually impaired responded as the use of scanner/reader to a moderate extent. 56.17 per cent responded as the use of braille printer /embosser to a great extent. Webcam and magnifier glass have a lesser extent of use with a response of 79.15 per cent and magnifier/magnifying glass respectively.

47. Use of hardware for speech & hearing impaired, which shows a great extent of use of alarming devices/signal systems and hearing aids with a response of 76.39 per cent and 78.47 per cent respectively. Text telephone device and portable speech synthesizer have a moderate extent of use by 51.39 per cent and 54.86 per cent speech & hearing people.

48. Walking frames/ ramps, and simple/electric wheel chairs used to a great extent with equal response of 94.19 per cent whereas 'adaptive keyboards' used to a moderate extend with a response of 83.72 per cent. But the adaptive devices, cursor control devices and speech input device use to a lesser extent by the locomotor impaired persons.

5.2.8 Awareness of assistive software/information system for differently abled persons.

49. Majority of the response of 'aware' about JAWS, Kurzweil, Orca and Daisy followed by NVDA and zoom text magnifier with 99.15 per cent whereas 94.47 per cent visually impaired aware of FS Reader and 89.36 per cent of visually impaired aware of LIOS.,

50. Skype' and 'Video captioning software' is used to 'a great extent' with a response of 72.92 per cent and & 0.83 per cent respectively by the speech & hearing impaired people. TTY emulating software is used to

a great extent with a response of 59.03 per cent. The picture software 'Big Mac' used with a response of 53.47 per cent to a great extent.

51. In the case of locomotor impaired, 40.70 per cent are using on screen board to a moderate extend, followed by voice recognition software (38.37 per cent) and word prediction completion (36.05 per cent).

5.2.9 Use of assistive software

52. Among the visually impaired 96.7 per cent, using 'JAWS' to a great extent, followed by DAISY (49.79 per cent) and Kurzweil (44.68 per cent). 59.15 per cent of visually impaired using 'FS Reader' to a moderate extent.50.64 per cent of visually impaired using 'NVDA' to a moderate extent.

53. The Skype' and 'Video captioning software' is used to 'a great extent' with a response of 72.92 per cent and &0.83 per cent respectively by the speech & hearing impaired people. TTY emulating software is used to a great extent with a response of 59.03 per cent. The picture software 'Big Mac' used with a response of 53.47 per cent to a great extent.

54. 40.70 per cent are using on screen board to a moderate extend, followed by voice recognition software (38.37 per cent) and word prediction completion (36.05 per cent)

5.2.10 Opinion of use of assistive technologies

55. Majority of the two categories under study responded as 'good' as 71.49 per cent of visually impaired, 76.39 per cent of speech & hearing impaired persons in their institutions whereas 46.5 per cent of locomotor impaired responded as 'good'. Almost equal percentage of visually impaired and speech & hearing impaired responded as 'excellent' with a response of 24.68 per cent and 20.83 per cent respectively. 53.49 per cent of locomotor impaired are responded as 'average'.

5.2.11 Opinion about the assistive software

56. It is found that among the visually impaired users 'JAWS' is the fully satisfied software with a response rate of 33.62 per cent followed by Kurzweil (33.19 per cent) and LIOS (30.21 per cent). Orca, FS Reader and DAISY satisfied software for the visually impaired users, whereas LIOS is not satisfied with a response rate of 22.55 per cent.

57. Fully satisfied software is the TTY emulating software with a response rate of 49.31 per cent, but 50.69 per cent responds shows that they prefer other technology, ie; conventional technology sign language. Skype video is the satisfied software among the speech and hearing impaired people followed by Big Mac software.

58. The 'On screen board' is the fully satisfied software among the locomotor impaired people with a response rate of 47.67 per cent. Dragon naturally Speaking and Voice recognition software is the satisfied software among the Locomotor impaired.

5.2.12 Opinion about the Assistive hardware for visually impaired

59. Visually Impaired are 'satisfied' with scanner/Reader, whereas 50.69 per cent are 'fully satisfied' with it. In the case of Braille Printer/Embosser 54.89 per cent 'Satisfied' with it, whereas 48.09 per cent of Visually Impaired are 'satisfied' with DAISY Player/Angel Player. 47.66 per cent of Visually Impaired are 'fully satisfied' with Braille Slate/Braille Computer.

5.2.13 Opinion about the Assistive hardware for speech and hearing impaired

60. Speech and hearing impairedpeople are 'satisfied' with TTY/TDD but 42.98 per cent are 'fully satisfied' with it. In the case of Assistive listening system 52.34 per cent are 'satisfied' with it. 52.34 per cent of Speech and hearing impaired are 'satisfied' with Closed captioned decoder, whereas 36.17 per cent are 'fully satisfied' with it.

5.2.14 Opinion about the Assistive hardware for locomotor impaired

61. Electric Wheelchairs 65.12 per cent of Locomotor Impaired are 'satisfied' and 33.72 per cent are 'fully satisfied', 50 per cent of

Locomotor Impaired are 'satisfied' with Adaptive furniture/Walking frames/Ramps whereas 38.37 'fully satisfied' with it. 24.42 per cent are 'fully satisfied' with Adaptive Keyboards whereas 74.42 are 'satisfied' with it.

5.2.15 Satisfaction and barriers of assistive technologies

62. Visually impaired persons are 'satisfied' with it whereas only 16.60 per cent are 'fully satisfied' with it. In the case of speech & hearing impaired persons, 36.81 per cent are 'fully satisfied' whereas 60.41 per cent are 'satisfied' with the various assistive technologies provided in the institutions. As per the response of locomotor impaired, 56.18 per cent are 'satisfied' whereas 40.70 per cent are 'fully satisfied'. Only 2.33 per cent of locomotor impaired have a response of 'not satisfied'

63. As per the Chi square test results of Table 71, there exists significant difference in the satisfaction level about assistive technology among differently abled persons regarding their category as the P value is zero.

64. As per the data in the table 73, It is found that the differently abled users are fully satisfied with the assistive technologies provided by the special centres followed by NGOs and schools. As per the Chi square test results of Table 73, there exists significant difference in the

satisfaction level about assistive technology among differently abled persons regarding their category as the P value is zero.

65. From the overall analysis it is found that libraries, NGOs and special centres providing assistive technologies for visually impaired persons to a great extent and for other two categories, up to their needs. So, in each institution the authority should give an extra care and funds should provide for providing more assistive technology facilities for each category. In the case of libraries-higher education level should implement UGC norms regarding the facilities for differently abled, which will make them more capable.

66. Lack of proper infrastructure' with a weighted mean value of 0.74, and it is the major problem faced by these categories of users. It is followed by the 'lack of sufficient assistive technology facilities' (0.70). Lack of institutional policies and lack of ICT skill among the users have the same weighted mean value (0.64) and forms the third main problem faced by them. 'Both staff and users must be trained' comes the fourth barrier, then comes the personal attention should provide in order to reduce the non-use of devices. These followed by lack of user involvement in their device selection, negative societal view towards the differently abled, technological problems related to connectivity etc.

5.2.16 Use of mobile Apps

67. The differently abled persons are also using mobile apps for their information support for daily living etc, among that, 84.69 per cent of visually impaired persons are using 'Talkback' followed by 'Google voice typing' with 51.06%. Only a small percentage, 10.63 per cent are using 'Go Read' mobile app. Speech & hearing impaired persons are a good user of mobile app such as 'scan life' & 'magnify' with 70.83 per cent and 93.75 per cent respectively. Locomotor impaired persons are using 'Nearby explorer' 'google voice typing' with a response rate of 37.20 per cent and 29.06 per cent respectively.

5.3 Tenability of hypotheses

1. *There is no significant difference in the level of knowledge about ICT based tools /services/activities among the differently abled persons in Kerala.*

As per the findings, 29, 30, 31,32, 33, 34 and 35, based on the table nos. 33,34,35,36,37,38 and 39 proved that there exists significant difference in the level of knowledge about ICT based tools/services/activities among the differently abled persons in Kerala. So, this first hypothesis is not fully satisfied.

2. *Most of the differently abled persons are aware and use available assistive technologies in their institution.*Findings such as 42, 43, 43,44, 45-51 based on the table no. 43, 44,45-52 *proves* that majority of the

differently abled persons are aware and use available assistive technologies in their institutions. So, this hypothesis should be fully substantiated.

3. *Use of assistive technologies is moderate level among the differently abled persons.*

In the case of level of use of assistive technologies, the findings number46,47,48,49-59 based on the table 53, 54,55 and figures 12 – 14, there is variation in the level of use of assistive technologies according to their categories. So, this hypothesis should not be fully satisfied.

4. *Differently abled persons are highly satisfied with the assistive technologies available for information support.*

The findings no.56,57,58,59,60 and 61based on the tables 57, 58, 59, 60, 61 and 62,There is a slight variation among the different categories of differently abled. So,this hypothesis should be partially substantiated.

5. *There is a significant difference in the satisfaction level in the use of assistive technologies among the differently abled persons in Kerala.*

Based on the findings no.62, 63 based on table 71 & 72 and figure 15, it is clear that there exists a significant difference in the satisfaction level.

As per the Chi square test results of Table 71, there exists significant difference in the satisfaction level about assistive technology among

differently abled persons regarding their category as the P value is zero.So, this hypothesis should be fully substantiated.

5.4 Suggestions and recommendations of the study

On the basis of the analysis and findings, the following recommendations have been put forwarded by the investigator.

1. Rights of Persons with Disabilities Act 2016 are to be strictly adhered to. Government must ensure efficient implementation of it.

2. The study strongly recommended that the authorities in each institution should keep a proper database of users and services in order to serve them to meet their changing needs.

3. Induction programmes. /Orientations programmes may be done at regular intervals.

4. Latest Information and Communication Technology /Assistive Technology for Differently abled persons may be provided effectively for their information support.

5. Specially trained staff to be employed to assist the differently abled persons in every institution.

6. The infrastructural facilities should be done on the basis of Universal Design Principals, keeping these people's needs in mind.

7. There may be a Centralised Learning resource centre for the exchange of information, source, service etc relevant to these people.

8. As per UGC norms all the higher education institutions will be disabled friendly, ie, they must obey the principles of Universal designing while for the buildings, services etc.

9. Institutional policies should be implemented in all educational institutions. The authorities should need to implement the policies whether any improvement need, do it properly.

10. Like NGO s proper computer training should give to these people which will reduce the barrier to information.

11. There should be a provision of funds should be made available from Central government to all institutions related to this field who provides services and Assistive Technologies to these people.

12. In the case of School students, all the text books should be made available in assistive forms like conventional braille or audio books like "Karnamrutham"from 1st standard to 12th standard at the time of printing text books for normal students .

13. Authorities should keep in mind WCAG guidelines while creating institutional websites and universal design principles while making buildings and other services.

14. All the information resources details will be made available online.

15. Services to differently abled persons should be 'mandatory' in the educational institutions at all levels from the basic School level to Higher educational level and adhere to the concept of inclusive education.

Based on all these suggestions investigator puts forward a proposal for an assistive information centre to these people as;

5.5 Assistive Information Centre for differently abled persons in Kerala: A proposal

Information is the basic need of any individual after food, shelter for the survival or existence in a better way in the society. There are many Government Policies Acts and Regulations at Central Government level and State level to serve the Differently abled persons .The proper implementation of these Policies along with planning designing and directing appropriate services through a nodal info centre for all categories of differently abled persons as per their information requirements will be a greater benefit to these persons for the upliftment of them in the society .

In this study, the findings revealed that each institution at their own level of providing the information services to the differently abled persons but some facilities are less and some are more. A solution to this problem is the designing of an assistive information centre for these persons to provide the needed information pin pointedly. such a centre will definitely contribute to

the information requirements of these differently abled persons in a proper way.

Here makes an attempt to explain the proposed model for the assistive information centre for the differently abled persons in Kerala.

The main objectives of the Centre should be

1. To identify the information requirements of the differently abled persons.
2. To act as a nodal agency in the State in order to provide the information related to these persons to provide guidelines to other institutions.
3. To maintain an up to date record of the Government policies and programmes for the development of these persons.
4. It should have a proper connection with non-Government organisations in the states providing services to these persons.
5. To establish and maintain links with the Government organisations in the country. Institutions it should act as a at state level and all level.

If with all these objectives, the proposed centre will be a beneficiary to all the differentially abled in Kerala. A proposed networked look of the centre will be as follows in figure 17.

Assistive Information Centre for differently abled persons in Kerala

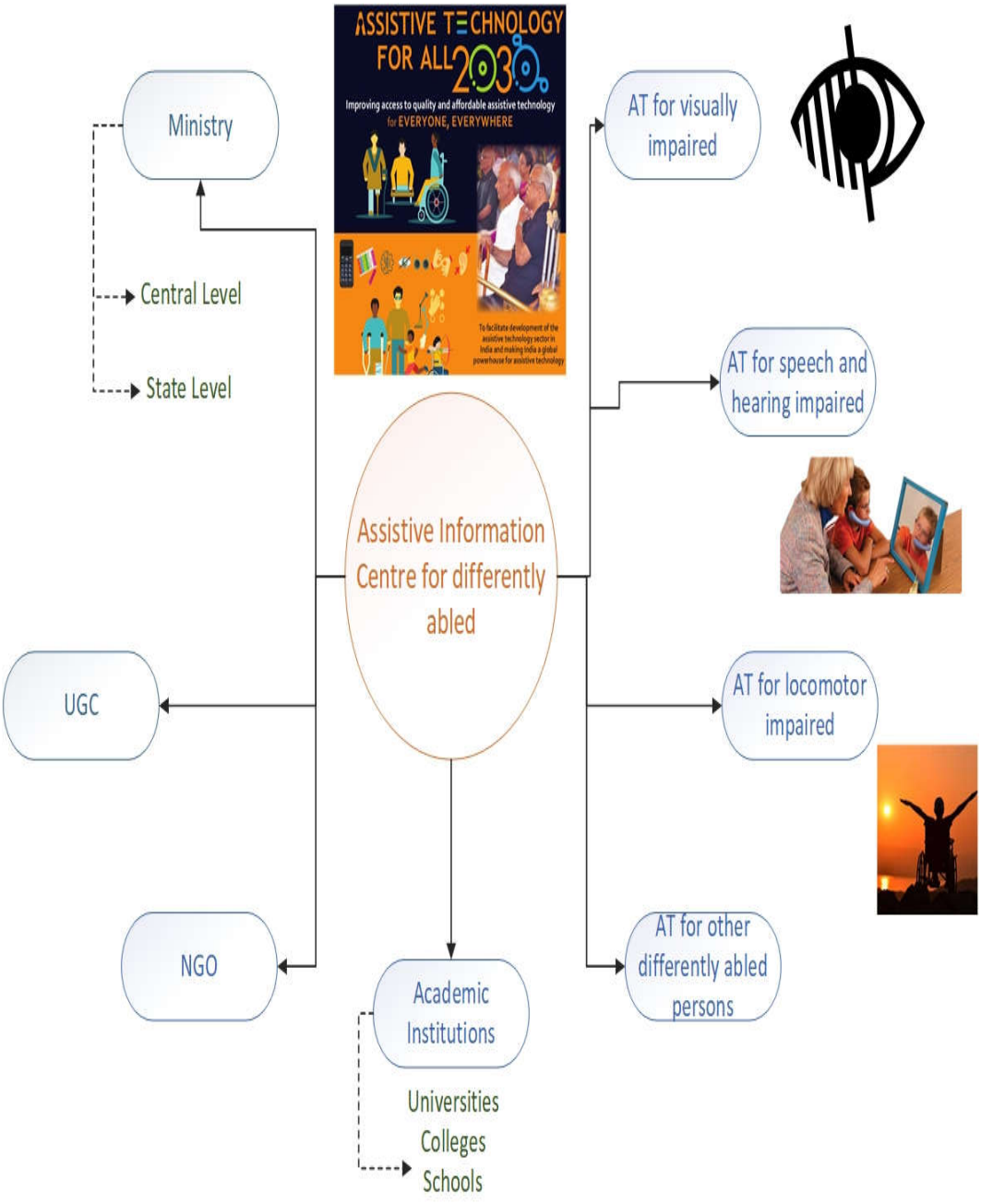

Figure 17 Assistive information centre for the differently abled

With all the above objectives, this center can impart the uptodate scientific information communication technology to educate and empower them and it will be a great achievement to the differently abled people the society. All the institutions in this network will ensure all technological facilities with all kinds of modern information sources to enhance the overall development of these people. Here, 'universal design principle' also should be in mind to simplify the life of these people by making products and services and the built environment more usable at little or no extra cost.

5.6 Suggestions for further research

Research is a continuous process. The end of one research study is the starting point of another research. The investigator feels that various studies can be conducted in the following dimensions as;

1. A complete survey is to be conducted to know the adequacy of assistive information service to the differently abled persons at national level.

2. The concept of inclusive education will made wide spread through research and implement it with necessary modification.

3. How the technological innovations can change the social and economic life of the differently abled persons and redefine the concept of disability in this information society.

5.7 Conclusion

As the information is fast growing, in order to cope up with it, all person should be move with it.So, all possible facilities and technologies should be provided to all persons including the differently abled to bring them into the mainstream of the society. The present day innovation of technology will improve the differently abled and it will enable them to come out from the shell and attain a very considerable degree of social recognition. For the successful survival of these communities information is a must and so the authorities, whether in library or in any other institution should provide all the avenues for their recognition and encouragement *ie*., with most educational and intellectual pursuits, library or any information centre can make a difference in the life of these differently abled people and so they can realise their potential. Simply it is important to remember one fact that differently abled people are also individuals and they have also information needs such as other normal people, so there should be a shift from the 'separation' to 'inclusiveness' *ie.,* inclusive education or inclusive library should be implement into a reality to make these people information rich.

In short, all the institutions from school level to higher education, nongovernmental organisation and special centres concerned with the information services to these people will be a great boon to them and so these institutions should be up to date in providing assistive technologies to them.

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APPENDICES

Appendix A

UNIVERSITY OF CALICUT
DEPARTMENT OF LIBRARY AND INFORMATION SCIENCE

Dear Sir/Madam,

I am pursuing research leading to Ph.D Degree in Library and Information Science in University of Calicut under the guidance of Dr.Jalaja.V, Associate Professor and HOD (Rtd), Department of Library & Information Science, University of Calicut. As part of the study, I have prepared a questionnaire intended to collect data/opinion/suggestions about assistive technologies provided to the differently abled persons. I earnestly seek your valuable cooperation and help for obtaining necessary information. I assure you that the information provided will be kept confidential and will be used only for research purpose.

Thanking You,

Yours faithfully

Minimol K.
Research Scholar
Dept. of Library and Information Sciences
University of Calicut.

A. General Information

1.1 Gender: a. Male □ b. Female □

1.2 Age: 11-20 □ 21-30 □ 31-40 □ Above 40 □

1.3 Name of your institution/Organization:

1.4 Status:

Student □ Teaching Faculty □ Others □

1.5 Which of the following category do you belonging to?

Visually impaired □ Speech &Hearing impaired □

Locomotor impaired □

B. <u>Facilities and services to Differently abled</u>

2.1 The place from where do you get resources to meet your information needs?

Rural □ Urban □

2.2 From where do you get resources for your information support?

1.	University Library	
2.	College library	
3.	Special schools	
4.	NGOs /Voluntary Organizations	
5.	Special centres	
6.	Other (Please specify)	

2.3 Is the institution which provides you information support located in a convenient place?

Yes □ No □

2.4 Does the entrance of the institutions has adequate clear openings/entrance/ doors?

Yes □ No □

2.5 Does your institution have ramps or elevators?

Yes □ No □

2.6 Whether Seating, lighting, ventilation etc are sufficient in your institution?

Yes □ No □

2.7 How often do you visit your institution?

Daily		Alternate Days	
Twice in a week		once in a week	

2.8 Time spend in your institution.

Below one hour		Average one hour	
Average 1-5 hours		More than five hours	

2.9 What is the main purpose of visiting the institution? (Please rank 1,2,3 etc.)

a.	To collect up-to-date information	
b.	To obtain employment information	
c.	To obtain educational information	
d.	To refer online journals/database	
e.	To read online newspapers	
f.	To collect motivational information	
g.	To collect recreational information	
h.	To interact with fellow being	

2.10. Please indicate the method adopted to locate the information you wanted.

a.	With the assistance of trained staff	
b.	Directly from the resources	
c.	With the help of friends	

2.11. Which are the specialised information sources do you get from the institution you depend for your information support?

	Information resources	
a.	Braille books	
b.	DAISY books	
c	Audio books	
d.	Printed documents	
e.	Video products with voice scripts	
f.	TTY/TDD	
g.	Video products with captioning	

2.12. Which of the information sources do you use most commonly?

	Information resources	
a.	Braille books	
b.	DAISY books	
c.	Audio books	
d.	Printed documents	
e.	Video products with voice script	
f.	TTY/TDD	
g.	Video products with captioning	

C. Use of ICT Based information resources/Devices/Tools/Services

3.1 What is your level of knowledge in using computer?

Good □ Medium □ Poor □

3.2 How did you acquire knowledge in computer?

a.	Self - learning	
b.	By attending courses	
c.	From friends	
d.	Other mode (please specify)	

3.3 How often do you use the following ICT based tools/Devices

	Devices	Always	Often	Sometimes	Rarely	Never
a.	Desktop Computer					
b.	Laptop computer					
c.	Notebook Computer					
d	Tablet					
e.	Mobile Phones					
f.	Printer					
g.	Scanner					

3.4 Please indicate your level of knowledge in using the following ICT based tools/Devices

	Devices	Excellent	Good	Average	Poor	Very poor
a.	Desktop Computer					
b.	Laptop computer					
c.	Notebook Computer					
d.	Tablet					
e.	Mobile Phones					
f.	Printer					
g.	Scanner					

3.5 Please indicate your level of knowledge in using the following ICT based activities

	Activities/processes	Excellent	Good	Average	Poor	Very poor
a.	Data entry					
b.	Pen drive copying/CD writing					
c.	Scanning					
d.	Playing Computer Games					
e.	Playing audio/ Video					

3.6 How do you rate your knowledge of the following web-basedactivities/services/tools/processes

	Activities/processes	Excellent	Good	Average	Poor	Very poor
a.	Internet browsing					
b.	Search engines (Yahoo, Google etc)					
c.	E-Mail (Gmail, Rediffmail etc)					
d.	Web based online catalogue (Library catalogue on the internet					
e.	Social networking activities such as Facebook, Whats App etc.					

D. <u>Awarenessand use of Operating systems/Assistive Technologies--Software/Hardware</u>

4.1 Which of the following operating system and software are you familiar with?

	Operating Systems	Familiar	Not familiar
a.	Windows		
b.	Linux		
c.	Android		

	Application software	Familiar	Not familiar
a.	Text processor (MS-Word, Libre Office)		
b.	Spread Sheet (MS-Excel)		
c.	Presentation (MS-Powerpoint)		
d.	Movie/Animation (Adobe Flash)		
e.	Graphics (Photoshop)		

4.2 Whether there is available various types of assistive technologies for your information support in your institution?

Yes □ No □

4.3 Please indicate whether you are aware of following types of assistive hardware facilities for the differently abled persons.

	For the visually impaired people only	Aware	Not Aware
a.	Scanner/Reader		
b.	Webcam		
c.	Voice Recorder		
d.	Braille Printer/ Embosser		
e.	Magnifier / Magnifying Glasses		
f.	Braille Computer		
g.	DAISY Player/ Angel player		
h.	Braille Slate		

	For the speech and hearing-impaired people only	Aware	Not Aware
a.	TTY/TDD		
b.	Portable Speech Synthesizer		
c.	Alarming devices/signal systems		
d.	Assistive Listening system		
e.	Closed captioned decoders		
f.	Hearing aids		

	For the the locomotor impaired people only	Aware	Not Aware
a.	Simple/ Electric Wheelchairs		
b.	Walking frames /Ramps		
c.	Adaptive furniture		
d.	Adaptive keyboards		
e.	Adaptive pointing devices		
f.	Cursor- control devices		
g.	Speech input device		

4.4. To what extent do you use the following types of assistive hardware facilities for the differently abled persons.

For the visually impaired people only

		To a great Extent	***To a moderate extent***	***To a lesser extent***
a.	Scanner/Reader			
b.	Webcam			
c.	Voice Recorder			
d.	Braille Printer/ Embosser			
e.	Magnifier / Magnifying Glasses			

f.	Braille Computer			
g.	DAISY Player/ Angel player			
h.	Braille Slate			
i.	Any Other (Please specify)			

For the speech and hearing-impaired people only

		To a great extent	***To a moderate extent***	***To a lesser extent***
a.	TTY/TDD			
b.	Portable Speech Synthesizer			
c.	Alarming devices/signal systems			
d.	Assistive Listening system			
e.	Closed captioned decoders			
f.	Hearing aids			
g.	Any Other (Please specify)			

For the locomotor impaired people only

		To a great extent	***To a moderate extent***	***To a lesser extent***
a.	Simple/ Electric Wheelchairs			
b.	Walking frames/Ramps			
c.	Adaptive keyboards			
d.	Adaptive pointing devices			
e.	Cursor- control devices			
f.	Speech input devices			
g.	Any Other (Please specify)			

4.5 Are you aware of following assistive software/information system for the differently abled persons?

For the visually impaired people only

	Screen Reader software	Aware	Not Aware
a.	JAWS		
b.	NVDA		
c.	Orca		
d.	FS Reader		
	Scanning Software		
e.	Kurzweil		
f.	LIOS		
	Magnifying Software		
g.	ZoomText magnifier		
h.	Screen enlargement software		

	Translation software	Aware	Not Aware
i.	***Duxbury software***		

j.	***DAISY***	Aware	Not Aware

For the speech and hearing impaired people only

a.	TTY emulating software		
b.	Dragon Dictate (Convert speech to text)		
c.	Big Mac (Picture Software)		
d.	Video captioning software		
e.	Skype		
f.	Any other (Please specify)		

For the locomotor impaired people

a.	Dragon naturally speaking		
b.	Voice recognition software		
c.	On-screen board		
d.	Word prediction completion		
e.	Any other (Please specify)		

4.6 To what extent do you use the following assistive software /information system for the differently abled persons.

For the visually impaired people only

	Screen Reader software	***To a great extent***	***To a moderate extent***	***To a lesser extent***
a.	JAWS			
b.	NVDA			
c.	Orca			
d.	FS Reader			
	Scanning Software			
e.	Kurzweil			
f.	LIOS			
	Magnifying Software			
g.	Zoomtextmagnifier			
h.	Screen enlargement software			

	Translation software	***To a great extent***	***To a great extent***	***To a lesser extent***
i.	***Duxbury software***			

		To a great extent	***To a great extent***	***To a lesser extent***
j.	***DAISY***			

For the speech and hearing impaired people only

		To a great extent	***To a moderate extent***	***To a lesser extent***
a.	TTY emulating software			
b.	Dragon Dictate (Convert speech to text)			
c.	Big Mac (Picture Software)			
d.	Video captioning software			
e.	Skype Video			
f.	Sign language			

For the locomotor impaired people only

		To a great extent	***To a moderate extend***	***To a lesser extend***
a.	Dragon naturally speaking			
b.	Voice recognition software			
c.	On-screen board			
d.	Word prediction completion			
e.	Any other (Please specify)			

4.7 Please indicate your opinion on the use of assistive technologies in your institution

Excellent		Good		Average		Bad		Not at all	

4.8 Please indicate your opinion about assistive software available in your institution.

Fully Satisfied		Satisfied		Not at all satisfied	

4.9 Please indicate your opinion about assistive hardware available in your institution.

Fully Satisfied		Satisfied		Not at all satisfied	

4.10. How far the following assistive technology is effective to support your information requirements. (Please rank according to your preferences by 1,2,3 etc).

Hardware

For the visually impaired people

a.	Scanner/Reader	
b.	Webcam	
c.	Voice Recorder	
d.	Braille Printer/ Embosser	
e.	Magnifier/ Magnifying Glasses	
f.	Braille Computers	
g.	DAISY Player/Angel player	

For the speech and hearing impaired people

	For the speech and hearing impaired people	
a.	TTY/TDD	
b.	Portable Speech Synthesizer	
c.	Alarming devices/signal systems	
d.	Assistive Listening system	
e.	Closed captioned decoders	
f.	Hearing aids	
g.	Any Other (Please specify)	

For the locomotor impaired people

a.	Simple/ Electric Wheelchairs	
b.	Walking frames/Ramps	
c.	Alarming devices/signal systems	
d.	Adaptive keyboards	
e.	Adaptive pointing devices	
f.	Cursor- control devices	
g.	Speech input devices	
h.	Any Other (Please specify)	

Software

For the visually impaired people

	Screen Reader software	
a.	JAWS	
b.	NVDA	
c.	Orca	
d.	FS Reader	
	Scanning Software	
e.	Kurzweil	
f.	LIOS	

	Magnifying Software	
g.	Zoomtext magnifier	
h.	Screen enlargement software	

	Translation software	
i.	***Duxbury software***	

j.	***DAISY***	

For the speech and hearing impaired people

a.	TTY emulating software	
b.	Dragon Dictate (Convert speech to text)	
c.	Big Mac (Picture Software)	
d.	Video captioning software	
e.	Skype Video	
f.	Conventional technology (Sign language)	

For the locomotor impaired people

a.	Dragon naturally speaking	
b.	Voice recognition software	
c.	On-screen board	
d.	Word prediction completion	
e.	Any other (Please specify)	

4.11. Do you use any mobile app for your information support?

Yes □ No □

4.12. If yes, which among the following are you are using for your information support?

a.	Ideal Accessibility installer (Talkback)	
b.	Scanlife barcode & QR reader	
c.	Magnify	
d.	Nearby explorer (navigating aid to travel)	
e.	Walky talky	
f.	Google voice typing	
g.	Go Read	
h.	Easy Reader	

E. <u>Assessing satisfaction level and difficulties while using assistive technologies</u>

4.13. Please indicate your rate of satisfaction about the assistive technologies for your information support.

		Fully Satisfied	***Satisfied***	***Not satisfied***
a.	Information resources in Braille.			
b.	Hard copy of the information by Braille printer/embosser.			
c.	Access to information by Daisy player.			
d.	Voice recorder to record academic lectures			
e.	Information resources related to educational, recreational employment in the form of Daisy books			
f.	JAWS is the most popular screen reader used today.			
g.	As JAWS reads aloud information, it is very flexible in the screen.			
h.	Hot –key commands of JAWS			
i.	JAWS work well with Internet explorer, Firefox & Mozilla			
j.	Tutorials, hot-key tip sheets of JAWS			
k.	JAWS is expensive and not affordable to everyone			
l.	NVDA is affordable.			
m.	NVDA ‘s speech synthesizer, e-speak			
n.	NVDA’s portability			
o.	Orca is a flexible assistive technology			
p.	As Orca is an OSS, no financial burden is there.			
q.	Orca’s screen reading capacity			
r.	Web access and keyboard navigation facility of Orca			
s.	Quick keys in FSReader			
t.	Kurzweil scans and print capability Of information sources.			
u.	Kurzweils book marking features.			
v.	LIOS is a easy to use and total accessibility solution software			
w.	Recognition capacity of selected areas of passage by LIOS			
x.	Text out of images from folder, pdf files etc by LIOS			

y.	Accurate text translator of Duxbury			
z.	Math translator of Duxbury			
aa.	Magnifying capacity of Magic software			
ab.	Communication through TTY			
ac.	On screen board			
ad.	Readable content of Dragon dictator			
ae.	Assistive listening system is powerful			
af.	Captions in closed caption devices			
ag.	Handsfree capacity of Dragon naturally speaking			
ah.	Skype Video			
ai.	Sign Language			
aj.	Ramps/Walking frames			
ak.	Wheel chairs/			
al.	Adaptive devices			
am	Alarming devices/Signal systems			

4.14 Please indicate your opinion about the barriers to access information through assistive technology in your institution. (Please rank according to your preferences by 1,2,3 etc.)

a.	Both staff & users must be trained	
b.	Lack of sufficient assistive technology facilities	
c.	Lack of user involvement in their device Selection	
d.	Negative societal view towards differently abled	
e.	Technological problem related to connectivity	
f.	Lack of proper infrastructure	
g.	Lack of ICT skill among users	
h.	Personal attention not provided in order to reduce the non use of devices	
i.	Poor fund ie, limited economic resources.	
j.	Being an information illiterate or technologically Illiterate.	
k.	In accessibility of chat/lab/ rest rooms	
l.	Lack of proper support from staff	
m.	Lack of interpersonal skill for working for differently abled persons.	

4.15. Please give your suggestions for improving the access of assistive technology for your information support.

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Thanking you

Appendix B

Interview schedule for Head of the institution

1. Name of the Organization/Institution/Library :
2. Parent organization :
3. Year of establishment :
4. Whether your institution functioning under
    a. Central Government :
    b. State Government :
    c. Autonomous :
    d. Private/NGOs :
    e. Any other :
5. Whether you are head of the institution/Librarian :
6. Total number of differently abled persons in your institution :
7. Does your institution provide following information sources for the DA

Sl.No.	Information sources	Yes	No
1	Braille books		
2	Talking books/Daisy books		
3	Large print books		
4	Scanned text		
5	Braille journals		
6	Online newspapers		
7	Text books		
8	Periodicals		

8. What is the source of funding for special services and equipments?
    a. UGC : □
    b. State Government : □
    c. By Donation : □
    d. Any other (Please specify) : □

9. Which of the following information services areprovided by your institution / library for the differently abled

a.	Retrieval of material from the stack	:	□
b.	Specialised orientation tours	:	□
c.	Braille print out	:	□
d.	Computer training	:	□
e.	Awareness campaign	:	□

10. Please mention the assistive technologies available in your institution

For the visually impaired people

a.	Talking Calculator	:	□
b.	Voice Recorder/ CD Player	:	□
d.	Braille Printer/ Embosser	:	□
e.	Speech Synthesizer	:	□
f.	Magnifying Glasses	:	□
g.	DAISY Player	:	□

For the speech and hearing impaired people

a.	TTY/TDD	:	□
b.	Portable Speech Synthesizer	:	□
c.	Alarming devices/signal systems	:	□
d.	Assistive Listening system	:	□
e.	Closed captioned decoders	:	□
f.	Hearing aids	:	□
g.	Any Other (Please specify)	:	□

For the locomotor impaired people

a. Simple/ Electric Wheelchairs : □

b. Walking frames : □

c. Adaptive furniture : □

d. Adaptive keyboards : □

e. Adaptive pointing devices : □

f. Cursor- control devices : □

g. Speech input devices : □

11. Do you have any policy for differently abled : □

12. How many trained staff do you have : □

13. What are the problems faced by you in providing information resources to these differently abled?

a. Lack of trained staff : □

b. In adequate funding : □

c. Expensive assistive technology equipment : □

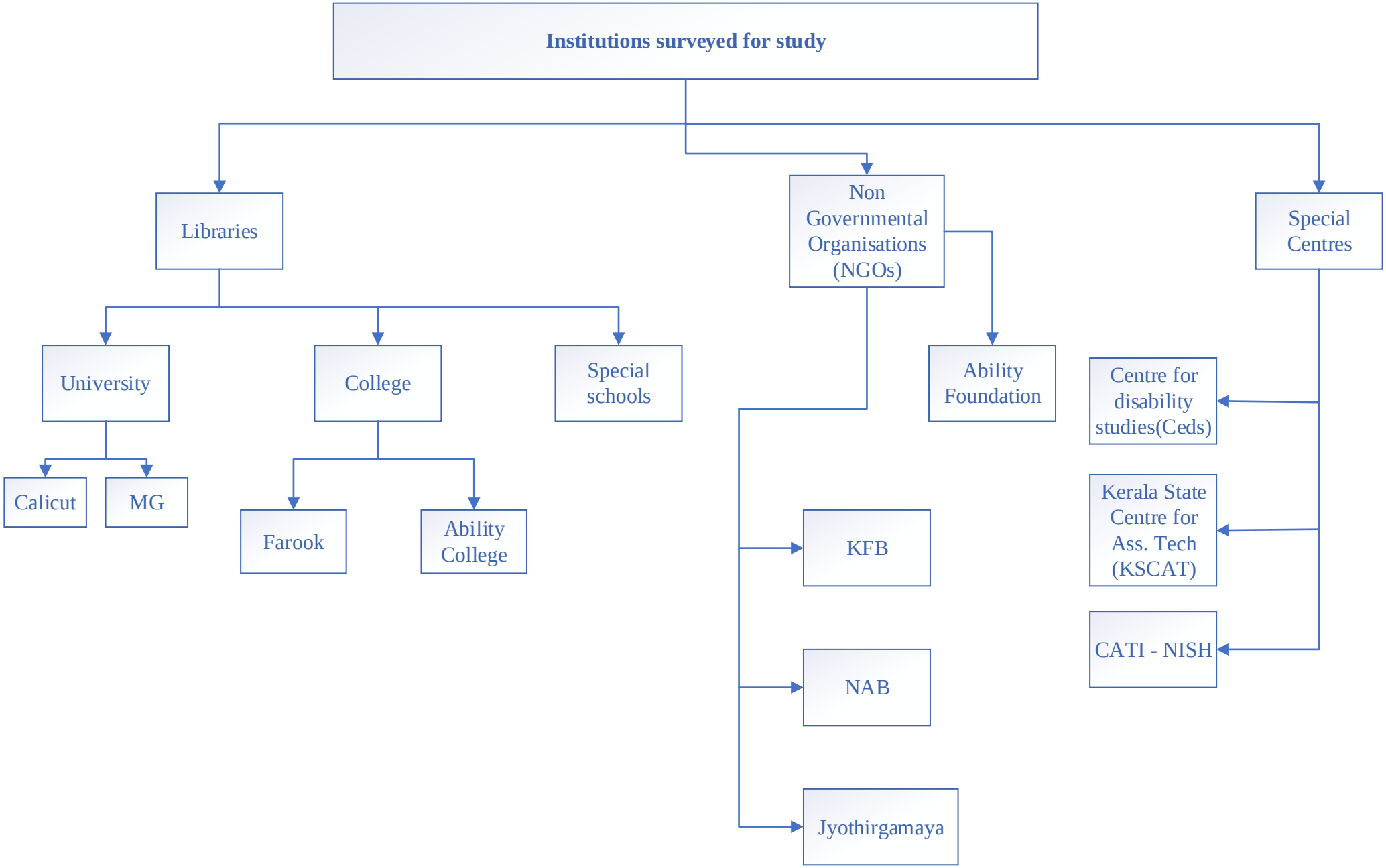
d. Lack of awareness of DA among staff

(negative attitude of staff) : □

e. Poor infrastructure : □

f. Lack of specialised information resources : □

Any other (Please specify) : □


Institutions surveyed for study
Libraries
Non Governmental Organisations (NGOs)
Special Centres
University
College
Special schools
Ability Foundation
Centre for disability studies(Ceds)
Calicut
MG
Farook
Ability College
KFB
Kerala State Centre for Ass. Tech (KSCAT)
NAB
CATI - NISH
Jyothirgamaya

Appendix D

List of special schools surveyed for the study

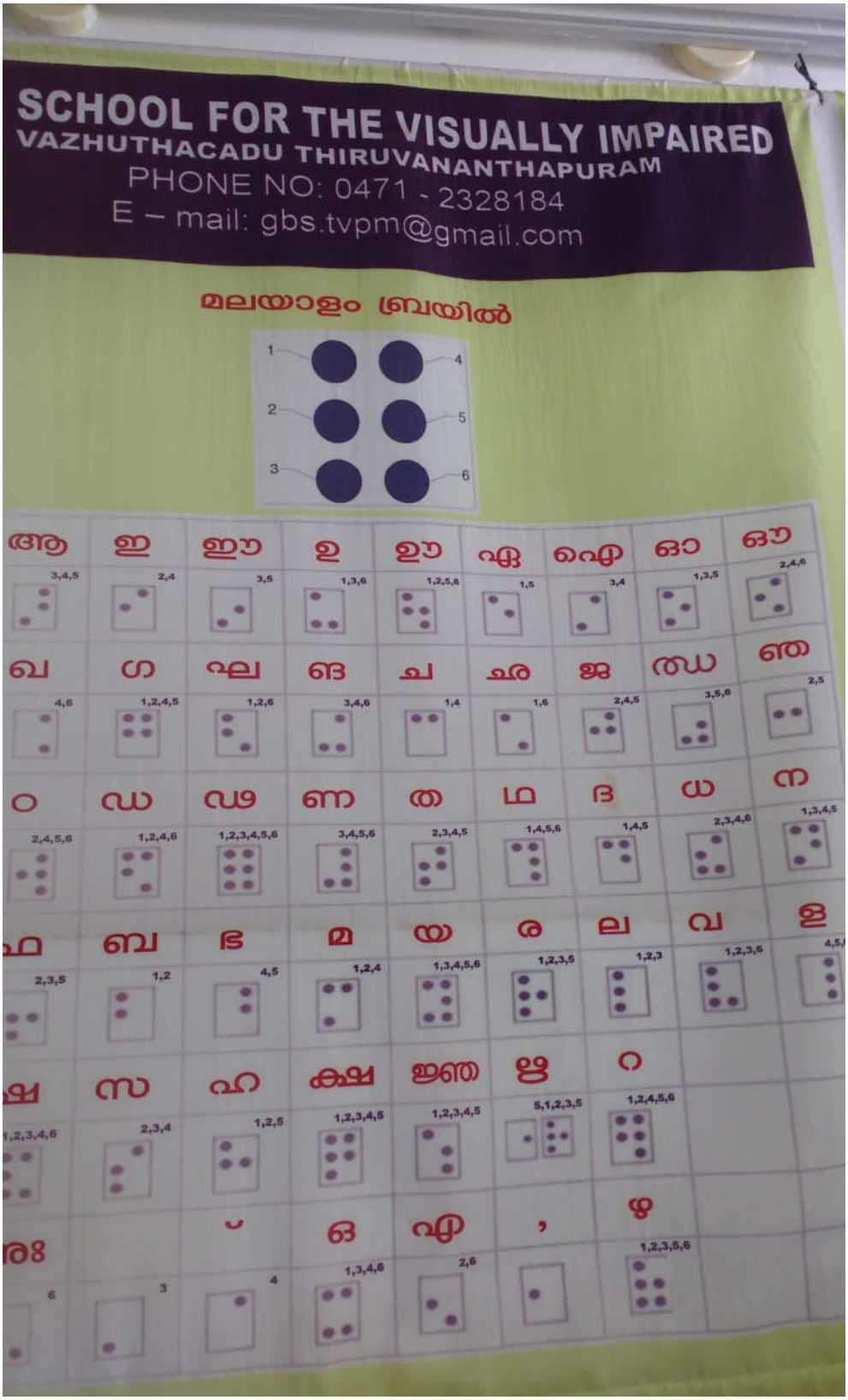
1. Govt school for visually impaired Thiruvananthapuram
2. Govt school for deaf and dumb, Thiruvananthapuram
3. Govt. school for blind, kunnamkulam,Thrissur
4. Kunnamkulam Govt. deaf vocational higher secondary school, Thrissur,
5. Calicut school for handicapped, Calicut
6. Calicut higher secondary school for handicapped, Calicut
7. School for the deaf, Parappanangadi, Malappuram
8. Karunya speech and hearing school. Calicut
9. Govt. school for blind, Kasaragode
10. Marthoma school for deaf, Kasaragode.

Appendix E

Types of assistive technologies for differently abled

1. Braille

2. Malayalam Braille



3. `Angel Player

4. **Braille printer**

5. **Adaptive keyboard**

6. **DAISY Player**

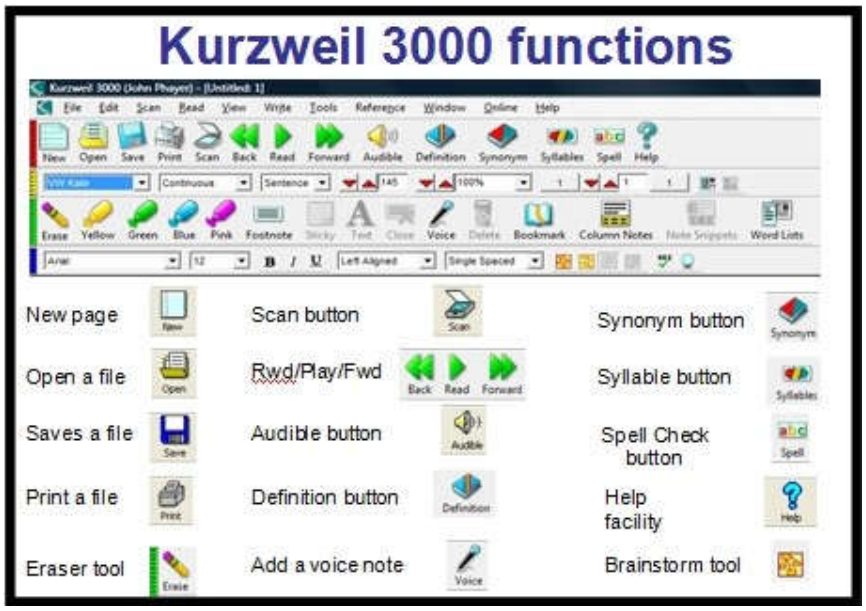
7. **Assistive listening System**

8. **Hearing aids**

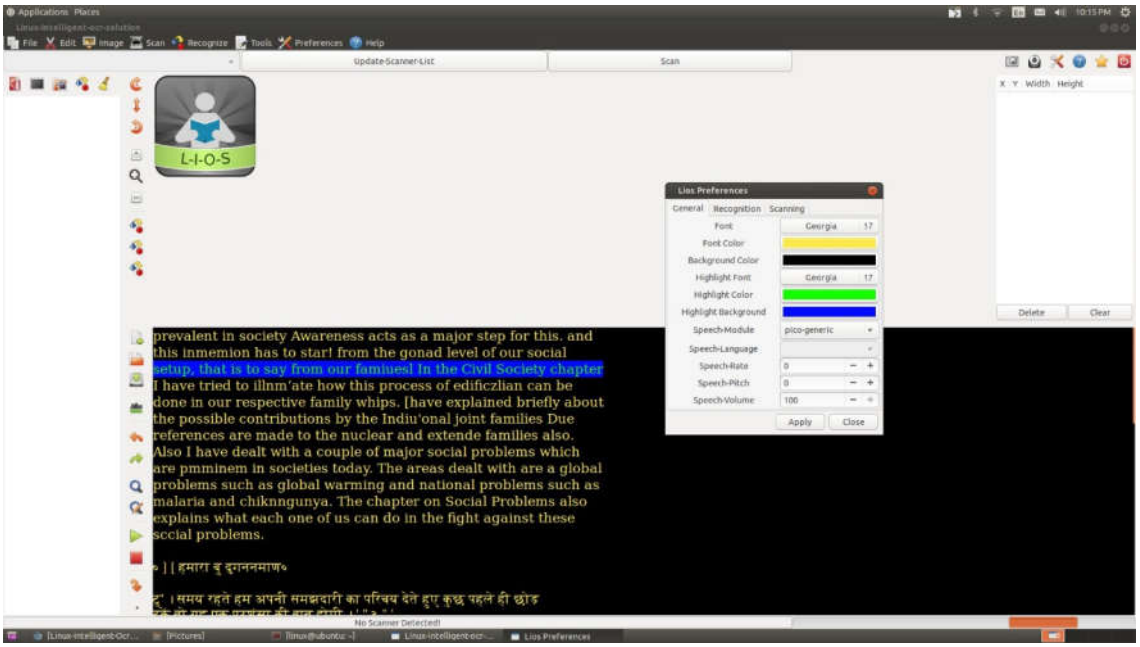
9. **Electric Wheelchair**

10. **JAWS (Screen reader software)**

11. Kurzweil (Scan & read software)



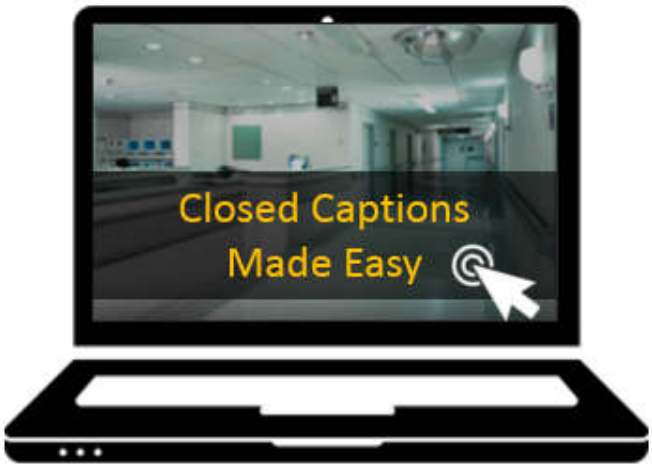
12. LIOS



13. **NVDA (Non Visual Desktop Access)**

14. **Skype**

15. Video captioning software



16. DAISY books

Step in creation of DAISY