DESIDOC Journal of Library & Information Technology, Vol. 35, No. 2, March 2015, pp. 90-99 DOI: 10.14429/djlit.35.2.8274

User's Perspective Towards Assistive Technologies Available in NCR Libraries of India

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ABSTRACT

This paper aims to examine the user's awareness and satisfaction level with the available assistive technology (AT) facilities for the people with disabilities in National Capital Region (NCR) libraries of India. Survey method and questionnaire has been used as the basic tool for data collection along with personal interviews of the experts. A total of 375 users in all the 15 libraries were selected randomly on the basis of willingness of the users to participate in the survey with the experience of working in digital environment. The survey results were tabulated and analysed with descriptive statistics methods using Excel software and 'Stata version 11'. People with disabilities have a good to fair understanding of the AT concepts and products. The users 'Strongly agree' towards the need of the AT to work in the digital environment. The study depicts lack of AT facilities in NCR libraries of India. Majority of users are 'Not satisfied' with available AT facilities and face various barriers in the use of AT in NCR libraries. This study will prove useful for the LIS professionals and the research community to provide an insight into the current status of the AT available in NCR libraries, India. This study is first to explore the viewpoint of people with disabilities regarding the ATs available in NCR libraries of India.

Keywords: Assistive technology, people with disabilities, NCR, assistive software, assistive hardware, blind/vision impaired user, deaf/hearing impaired user, locomotor impaired user

1. INTRODUCTION

There has been an increasing recognition of abilities of persons with disabilities in India with emphasis on mainstreaming them in the society on the basis of their capabilities. In this regard Government of India has enacted three legislations for persons with disabilities, i.e., (i) Persons with Disability (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995 (ii) National Trust for Welfare of Persons with Autism, Cerebral Palsy, Mental Retardation and Multiple Disability Act, 1999. Ministry of Social Justice & Empowerment[1] and (iii) Rehabilitation Council of India Act, 1992. It is estimated that over 21 million people in India are suffering from different types of disabilities which is equivalent to 2.1% of the total population of the country[2]. Since, the problem of disability is gaining more and more importance all over the world, the planners of India very well understand the significance of the problem and therefore various policies and programs are framed by the government for the people with the disabilities in India.

The library profession has long championed in providing services and materials to all its patrons equally which is one of the fundamental beliefs inherent in this profession[3]. As, it is already established fact that access to information is one of the most important human rights which allows the individual to develop himself/herself and participate actively within a democratic society, fully exercising his/her rights and duties[4]. Thus, all citizens should have equality in access to information that will enable them to be active contributors and participants in the society. In this modern digital age, assistive technologies play an important role in the lives of people with disabilities to provide them access to the variety of resources and services available in the libraries as well as on the web. The term 'Assistive technology' in general refers to the software and hardware designed and developed to assist the individuals with disabilities which might otherwise prevent them from making effective use of the various ICT facilities[5]. According to Brophy and Craven[6], the computer related aids and equipments

Received 15 December 2014, revised 13 February 2015, online published 20 March 2015

like video magnifiers, electronic readers, optical character recognition software, magnification software and speech output systems, etc. that provides a solution for a particular individual with disability to work in the digital environment are commonly known as 'assistive' or 'adaptive' technology. In simple words, "Assistive technologies refer to products, devices or equipments that are used to maintain, increase or improve the functional capabilities of people with disabilities" Koulikourdi[13]. According to Goddard[15], Assistive technology may be as simple as a magnifying glass or it can also be sophisticated as a computer workstation which can be configured by the libraries according to the needs of the specific user groups like provision of speech recognition software for the blind to control the computer or enter the text via their voices, the touch screen monitor and an electronic tracking device for those who cannot make use of standard keyboards. The accessible workstation[19] provides adjustable worktable to the users along with an ergonomic keyboard and a large monitor around 20 inches or larger which allows patrons using screen-enlarging software to view the displayed text clearly while moving through the documents.

2. LITERATURE REVIEW

In an earlier study of libraries in the North-West of England, Jeal, *et al.* presented the service provision to deaf and hard of hearing people with the material and technological developments such as loop systems, minicoms (text telephones), building adaptations, computer and videophone service facilities. The study examines the potential of these technologies in revolutionising the approach of deaf people in acquiring information.

In a particular study, Hopkins[7] focussed on the various assistive devices available for the people with disabilities that can be applied to address a variety of personal needs, like users with hearing challenges can make use of various assistive listening devices, captioning features and text telephone (TTY) or telecommunication devices for the deaf (TDD). Users unable to communicate verbally can make use of portable augmentative and alternative communication (AAC) devices to speak that allows customized programming to facilitate communication in multiple environments. Cantor[8] provides the adaptable approach for the librarians planning the library services provides an approach for choosing accessibility aids that puts high-technology devices into a broader context. The study also focus on the transportation services like book pick-up and delivery services for people who cannot get into the library building is of prime importance as such a service is valuable for people who are terminally ill or whose mobility prevents them from using the library facilities.

Lisiecki[9] pointed that the area of adaptive technology is growing rapidly and making various assistive software applications available for the computer users with the disabilities which differ and range in functionality from simple to highly specialized, to meet the user's needs like screen reading software JAWS (Job Access With Speech), OMNI 1000 and OMNI 3000, etc. Libraries should choose only those technological solutions which are useful in the library setting.

Ethridge[10] elaborates that large print books, books on tape, books on CD, and e-books are all additional options for accessing written information that can meet the needs of the users with low vision. Assistive technologies increase independence in accessing printed information in libraries therefore librarians need to understand how computer-based and non-computer-based assistive technology can assist individuals with disabilities in accessing printed information. Several important software programs available for library patrons with blindness or visual impairments includes Duxbury Braille Translator (DBT), CakeTalking, DocReader, Reading Bar, Connect Outloud, Kurzweil 1000 Sunrich and Green[11]. It is not possible for any library to plan for every single patron's needs and selecting, installing and maintaining one or more of the most popular assistive software programs. Therefore, a study by McHale[12] emphasize on five software options for the libraries which can be adopted to provide the services to the blind/vision impaired users which includes 'JAWS for Windows' from Freedom Scientific, 'Window-Eyes' screen-reading program with portable application, 'ZoomText' magnifier/ reader and 'ZoomText' keyboard, 'Dragon Naturally Speaking' which is a speech-to-text engine that allows users to dictate into Windows-compatible programs, such as Microsoft Word and Outlook and last one is 'Text Aloud' which is a Text-to-Speech (TTS) software. The library staff should also consider adoption of a long-term strategy for planning for user with disabilities.

Koulikourdi[13] investigated the current use of assistive technologies in Greek libraries and revealed the lack of AT in Greek libraries and depicted that the current legal and regulatory framework with regard to AT is insufficient. Also, Greek libraries are in an early stage of providing equal and effective services to patrons with disabilities and many libraries are found totally unaware and unfamiliar with concepts such as accessibility and assistive technology issues. In India, "M.K. Tata Memorial Learning Centre for Visually Challenged Students" has been set up at Sir Dorabji Tata Memorial Library, TISS in 2008 to provide innovative teaching techniques and philosophy that continues to have far-reaching effects on the lives of visually-challenged and taking them to new heights of independence.

The Centre has acquired latest technologies to assist visually-impaired readers and presents a successful case to illustrate how bests the university library's information resources and services could be extended to its disabled user community Koganurmath and Chowkimath[14]. The reviewed studies reveal that the adaptive technology greatly enhance and improves the information access for the disabled but the selection of appropriate adaptive/assistive technology for the libraries among the thousands of resources available today is an issue of great challenge for the librarians. Therefore, librarians should make necessary considerations before adopting these technologies into their system by deeply examining the available research literature in the area and gaining knowledge through the experiences of the other libraries.

3. OBJECTIVE AND SCOPE

This study is focused on the study of the user's perspective towards the assistive technologies available for the people with disabilities in National Capital Region (NCR) libraries of India to work in digital environment. In this regard, the research study is based on the five major objectives:

(1) Study the user's awareness about the Assistive technologies available today;

(2) Explore the user's perspective towards the need of Assistive technologies in their lives;

(3) Identify the types of Assistive technologies available in the NCR libraries for the people with disabilities;

(4) Know user's satisfaction level with regard to the Assistive technologies available in the NCR libraries of India; and

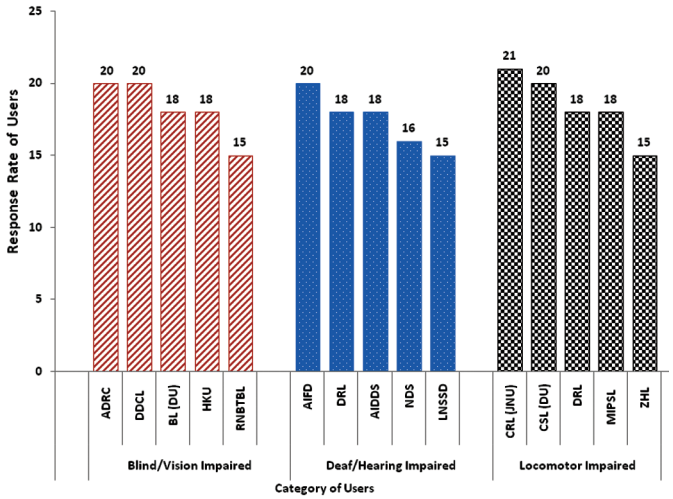
(5) Determine the various barriers faced by the users in the use of Assistive Technologies.

The scope of the research work is having certain limitations regarding the location, type of the users and the survey population of the study. The study is limited to NCR only and the type of the users selected for the study includes blind/vision impaired users, deaf/hearing impaired users and locomotor impaired users only among the people with disabilities. The type of organizations selected for the study includes the leading academic and special institutions/libraries serving the people with disabilities in NCR region. Total 15 libraries are selected for the research study (i.e., 5 institutions/ libraries each serving the blind/vision-impaired, deaf/ hearing-impaired and locomotor-impaired users, respectively). The 15 institutions/libraries selected for the present study are:

1. Amba Dalmia Resource Centre (ADRC), Miranda House
2. Durgabai Deshmukh College Library (DDCL), Blind Relief Association
3. Braille Library (BL), University of Delhi
4. Hellen Keller Unit (HKU), Jawaharlal Nehru University
5. Ram Nath Batra Talking Book Library (RNBTBL), National Association of the Blind (Libraries serving Deaf/hearing impaired users)
6. All India Federation of the Deaf (AIFD)
7. Daulat Ram Library (DRL), Amar Jyoti Research and Rehabilitation Centre (For Deaf/Hearing impaired users)
8. All India Deaf and Dumb Society (AIDDS)
9. Noida Deaf Society (NDS)
10. Lady Noyce Secondary School for the Deaf (LNSSD) (Libraries serving Locomotor impaired users)
11. Central Reference Library (CRL), Jawaharlal Nehru University
12. Central Science Library (CSL), University of Delhi
13. Daulat Ram Library (DRL), Amar Jyoti Research and Rehabilitation Centre (for Locomotor impaired users)
14. Model Integrated Primary School Library (MIPSL), Pt. Deendayal Upadhyaya Institute for the Physically Handicapped
15. Zakir Husain Library (ZHL), Jamia Millia Islamia

4. METHODOLOGY

In this study the term 'People with Disabilities' has been used for the people who are blind/vision-impaired (i.e., total absence of sight/person with impairment of visual functioning even after treatment or standard refractive correction but who uses or is



Note: n=25 (=100%), Representative population from each Library

Figure 1. User's response rate.

potentially capable of using vision for the planning or execution of a task with appropriate assistive device), deaf/hearing impaired (i.e., complete hearing loss/ loss of sixty decibels or more in the better ear in the conversational range of frequencies) and people suffering from locomotor disability (i.e, disability of the bones, joints or muscles leading to substantial restriction of the movement of the limbs).

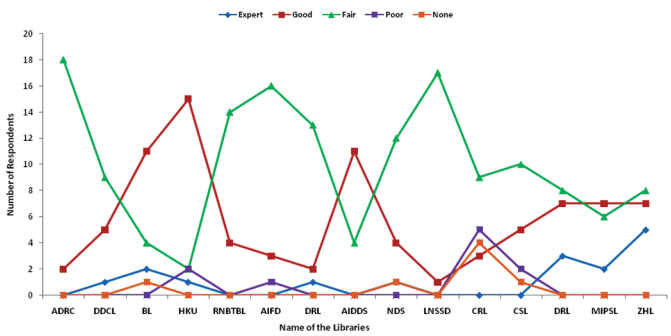
The total number of respondents surveyed in each of the libraries is 25 (=100%) constituting as a whole population (i.e., sample population) of the individual library. The total number of users surveyed is based on random selection and categorized as faculty members, research scholars, graduates, post-graduates, high school/intermediate and primary school students enrolled in various academic and vocational training courses in different institutions in NCR, Delhi. The total three sets of Likert-type questionnaires were prepared for the three different groups of the users (i.e., blind/vision-impaired, deaf/hearing impaired and locomotor impaired). The help of 'sign language Interpreters' was taken to communicate with the deaf/hearing impaired users.

The present study used survey method for data collection with the help of questionnaires and personal interviews with the experts and the users of the NCR libraries. The survey results were tabulated and analsed with descriptive statistics methods using Excel software and 'Stata version 11'.

5. ANALYSIS

5.1 User's Awareness about Assistive Technology

There are various types of assistive aids/devices available today for the people with disabilities that enable them to work in the modern digital environment. The use of the assistive technology depends on the awareness and knowledge of the users thus in this regard the following Fig. 2, explores the knowledge of the respondents about the assistive aids/devices available today. The findings clearly shows that highest number of users in majority of libraries, i.e., 18 (72%) in ADRC, 17(68%) in LNSSD, 16 (64%) in AIFD, 14(56%) in RNBTBL, 13(52 %) in DRL, 12(48%) in NDS, 10(40 %) in CSL, 9(36 %) each in DDCL and CRL and 8(32%) each in DRL and ZHL, respectively. Further the findings shows that majority of users, i.e, 15(60 %) in HKU, 11(44 %) each in BL and AIDDS and 7(28 %) in MIPSL have a good understanding of the AT concepts and products. Also, few respondents in ZHL (5; 20%), DRL (3; 12%), BL (2; 8%), MIPSL (2; 8%) and only 1(4%) user each in DDCL, HKU, DRL and NDS, respectively, classified themselves as 'Expert'.



Note: n=25 (=100%), Representative population from each library

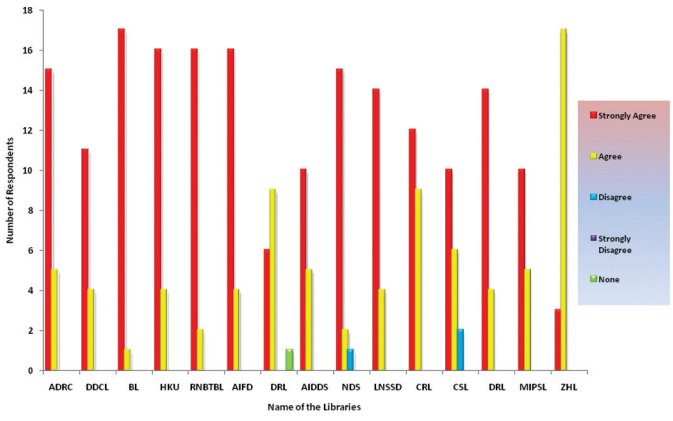
Figure 2. User's awareness about assistive technology.

5.2 User's Perspective Regarding the Need of Assistive Technology

Computers in libraries are essential tools and assistive technology is the key to use them for the people with disabilities. The AT involves a device or a computer-based accommodation that helps an individual with special needs to work and compensate for a disability and enhancing individual ability[15] to gain access to the vast amount of resources and services through internet which were previously inaccessible to them. Fig. 3, depicts that majority of respondents in all the libraries except DRL and ZHL, i.e., 17(68 %) in BL; 16(64 %) each in HKU, RNBTBL and AIFD; 15(60%) each in ADRC and NDS; 14(56%) each in LNSSD and DRL; 12(48%) in CRL; 11(44%) in DDCL; and 10(40%) each in AIDDS, CSL and MIPSL, respectively, 'Strongly agree' towards the need of assistive technologies by the users with disabilities to use a computer. The findings shows that majority of users in DRL (9; 36%) and ZHL (17; 68%) 'Agree' to the need of assistive aids/devices in their lives to work in the digital environment.

5.3 User's Awareness about the Available Assistive Hardware Facilities

Libraries dealing with the people with disabilities need to procure the latest assistive hardware facilities to facilitate access to the information and the necessary resources required by them. Table 1



Note: n=25 (=100%), Representative population from each Library

Figure 3. User's viewpoint towards need of assistive technology.

shows the awareness of individual category of users about assistive equipment/devices in the institution/ library for them.

It is observed from the findings that among all the libraries serving the blind/vision impaired users, the maximum respondents are aware of the availability of the 'Scanner/Reader' in their libraries, i.e., 80% each in ADRC and HKU, 72% in RNBTBL, 68% in BL and 60% in DDCL. The Voice Recorder/CD player is another popular assistive device about which majority of users are aware in all the libraries except in HKU (i.e. 80 % in ADRC, 72 % in RNBTBL, 60 % in DDCL and 28% in BL, respectively). Talking calculators and Magnifying glasses are available on payment basis in the respective libraries. Users who require these devices can purchase them for their personal use from the institution. Sometimes Venu Eye Hospital use to donate the magnifying glasses to the users with low vision at RNBTBL. The maximum assistive hardware facilities are available and used by the users in BL and RNBTBL. Also, Table 1 shows that 'Hearing aids/Cochlear implants' is the popular assistive device about which majority of deaf/hearing impaired users are aware in all the libraries, i.e., 68% in LNSSD, 64% in NDS, 60% in DRL, 56% in AIDDS and 36% in AIFD, respectively. In AIDDS, DRL and NDS, 44%, 28% and 20% users, respectively, are aware of the 'Closed captioned decoders' in their libraries. The above results indicate that among all the libraries only AIDDS have maximum assistive hardware facilities available for the deaf/hearing impaired users.

Lastly, it is found that in DRL (18; 72%) and MIPSL (15; 60%), maximum respondents are aware of the availability of the 'Simple/Electric Wheel Chairs' in their libraries. 'Simple/Electric wheel chairs' and 'Adaptive furniture' are two common assistive hardware facilities available in all the libraries except ZHL. Not a single assistive hardware facility is available in ZHL for the locomotor-impaired users. The maximum assistive hardware facilities are available in CRL for the locomotor-impaired followed by DRL and MIPSL.

Table 1. Awareness of users about assistive hardware facilities

Hardware/s available	**Name of the library**				
For the blind/vision impaired users	**ADRC**	**DDCL**	**BL**	**HKU**	**RNBTBL**
Scanner/Reader	20 (80 %)	15 (60 %)	17 (68 %)	20 (80 %)	18 (72 %)
Talking Calculator	-	2 (8 %)	7 (28 %)	1 (4 %)	12 (48 %)
Voice Recorder/CD player	20 (80 %)	15 (60 %)	7 (28 %)	-	18 (72 %)
Braille Printer/Embosser	-	14 (56 %)	15 (60 %)	18 (72 %)	18 (72 %)
Speech Synthesizer	-	6 (24 %)	7 (28 %)	4 (16 %)	1 (4 %)
Magnifying Glasses	-	-	3 (12 %)	-	7 (28 %)
Any other (Tactile Image Enhancer, Single Handed Keyboard)	-	-	1 (4 %)	4 (16 %)	-
Hardware/s available for the deaf/hearing impaired users	**AIFD**	**DRL**	**AIDDS**	**NDS**	**LNSSD**
TTY/TDD	-	-	-	-	-
Portable Speech Synthesizer	-	-	1 (4 %)	-	-
Alarming Devices/Signal Systems	-	-	-	-	-
Assistive Listening System	-	-	11 (44 %)	-	-
Closed Captioned Decoders	-	7 (28 %)	11 (44 %)	5 (20 %)	-
Hearing Aids/Cochlear Implants	9 (36 %)	15 (60 %)	14 (56 %)	16 (64 %)	17 (68 %)
Hardware/s available for the locomotor impaired users	**CRL**	**CSL**	**DRL**	**MIPSL**	**ZHL**
Prosthetic and Orthotic Devices	-	-	11 (44 %)	5 (20 %)	-
Simple/Electric Wheel Chairs	4 (16 %)	5 (20 %)	18 (72 %)	15 (60 %)	-
Walking frames/Rolators	3 (12 %)	-	17 (68 %)	14 (56 %)	-
Adaptive Furniture	3 (12 %)	7 (28 %)	14 (56 %)	11 (44 %)	-
Adaptive Keyboards (e.g. Muppet Learning Keys, Power Pad, Unicorn Board, Touch Windows)	4 (16 %)	-	-	-	-
Adaptive Pointing Device	2 (8 %)	-	-	-	-
Cursor-control Devices (e.g. Adaptive Firmware Card, Multi Switch Adapter Box)	-	-	-	-	-
Speech-input devices	8 (32 %)	-	-	-	-

Note: n=25, where percent exceeds 100% as users were allowed for multiple responses

5.4 Users' Awareness about Available Assistive Software

The assistive software is boon to the people with disabilities which enables them to use the computers and access the information from the web at their personal desk. As assistive software have become a necessity for the users in this technological age therefore the Table 2 examines if there are sufficient assistive softwares facilities available in the libraries for the users with disabilities.

Table 2 shows that 'JAWS' is available and used by majority of blind/vision-impaired users in all the libraries (i.e. by 80 % users each in ADRC and HKU, 72% in RNBTBL, 68 % in BL and 60 % in DDCL, respectively). The second popular software is 'SAFA' about which majority of users are aware in ADRC (20; 80 %), RNBTBL (18; 72 %) and BL (17; 68 %). The 'Kurzweil reader' is third most preferred software among the users in all the libraries, i.e., 76 %, 64 %, 52 %, 8% and 4 % users in HKU, BL, DDCL, ADRC and RNBTBL respectively responded that 'Kurzweil' is available in their library and used by them frequently. Lastly, the 'Zoom Text Magnifier/Reader' is found as the common software available and used by blind/ vision impaired in all the libraries contributing to 12 (48 %) respondents each in BL and HKU, 11 (44 %) in RNBTBL and 4 (16 %) each in ADRC and DDCL respectively. The maximum assistive software facilities are available in BL followed by DDCL and RNBTBL. It is found that in HKU; '*SAFA*' software is installed only on one system. '*Lekha*' is personalised Hindi software used in BL (University of Delhi) and '*Shruti*' Screen reader for Hindi is created by a blind user at DDCL, Blind Relief Association which is yet to be launched.

Further it is examined that there are very less assistive software facilities available for deaf/hearing impaired users in NCR libraries of India. The majority of users in all the libraries (i.e., 72 % in AIFD, 60 % in NDS, 52% in AIDDS and 20 % in DRL,

Table 2. Awareness of Users about various assistive software

Software/s available	**Name of the library**				
For blind/visualy impaired users	**ADRC**	**DDCL**	**BL**	**HKU**	**RNBTBL**
SAFA	20 (80 %)	5 (20 %)	17 (68 %)	2 (8 %)	18 (72 %)
JAWS	20 (80 %)	15 (60 %)	17 (68 %)	20 (80 %)	18 (72 %)
Window-Eyes	-	-	3 (12 %)	-	3 (12 %)
Zoom Text Magnifier/ Reader	4 (16 %)	4 (16 %)	12 (48 %)	12 (48 %)	11 (44 %)
Kurzweil	2 (8 %)	13 (52 %)	16 (64 %)	19 (76 %)	1 (4 %)
Multilingual/Bilingual OCR	-	1 (4 %)	5 (20 %)	1 (4 %)	-
Doc Reader	-	3 (12%)	6 (24 %)	4 (16 %)	3 (12 %)
Duxbury	-	8 (32 %)	9 (36 %)	13 (52 %)	14 (56 %)
Screen Enlargement Software	-	-	-	-	1(4%)
Any other (Shruti Screen Reader/Lekha/ Sparsha for Hindi and Sanskrit Translation, Talking Typer, Maths Flash software, Fine Reader)	-	3 (12 %)	1(4 %)	-	-
For deaf/hearing impaired users	**AIFD**	**DRL**	**AIDDS**	**NDS**	**LNSSD**
TTY emulating software	-	-	-	-	-
Dragon Dictate (convert speech to text)	-	-	-	-	-
Big Mac (Picture Software)	-	-	-	-	-
Cheap Talker (Picture Software)	-	-	-	-	-
I Communicator	11 (44 %)	-	9 (36 %)	7 (28 %)	-
Video Captioning Software	18 (72 %)	5 (20 %)	13 (52 %)	15 (60 %)	-
For locomotor-impaired users	**CRL**	**CSL**	**DRL**	**MIPSL**	**ZHL**
Dragon Naturally Speaking	2 (8 %)	-	-	-	-
Voice Recognition Software	2 (8 %)	-	-	-	-
On-Screen Keyboard	1 (4 %)	2 (8 %)	-	-	-
Word prediction-completion	-	-	-	-	-
Abbreviation expansion	-	-	-	-	-
I-Learn (by NIIT, India)	-	-	-	-	-

Note: n=25, where percent exceeds 100% as users were allowed for multiple responses

respectively) except LNSSD are aware of 'Video Captioning Software' followed by 'I-Communicator' in AIFD (11; 44 %), AIDDS (9; 36 %) and NDS (7; 28 %). Not a single assistive software facility is available in LNSSD for the users.

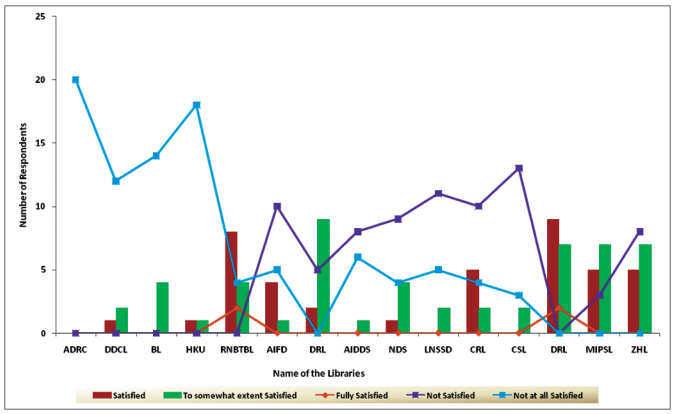
It is also found that there are negligible amount of assistive software facilities available for the locomotor-impaired users in NCR libraries. The findings show that only CRL (Jawaharlal Nehru University) has few assistive software facilities for the locomotor impaired users (i.e., Dragon Naturally Speaking, Voice Recognition Software and On-Screen Keyboard). In CSL, only 2 (8 %) users are found aware of 'On-Screen keyboard' software in the library. Also, the results show that there is not a single assistive software facility available in DRL, MIPSL, and ZHL for locomotor-impaired users.

5.5 Users' Satisfaction Level towards available Assistive Technologies

In this age of information technology, people with disabilities too are aware of the various assistive technologies available for them and want to utilise the benefits of these technologies. The libraries/institution serving the people with disabilities are responsible in facilitating the access to these assistive technologies to them. Figure 4 analyses the satisfaction level of the users towards the available assistive software/hardware facilities at their institution/library and clearly depicts that majority of blind/vision-impaired users in all the libraries, i.e., in ADRC (20; 80 %), HKU (18; 72 %), BL (14; 56 %) and DDCL (12; 48 %) except RNBTBL are 'Not at all satisfied' with the available Assistive software/hardware facilities at their institution/library. In RNBTBL, users (8; 32 %) are 'Satisfied' with the available assistive technology facilities in the library.

Also, it is found that many of deaf/hearing impaired users in all the libraries except DRL i.e., in LNSSD (11; 44 %), AIFD (10; 40 %), NDS (36 %) and AIDDS (8; 32 %) are 'Not satisfied' with the available Assistive technologies at their institution/library. In DRL, majority of users (9; 36 %) are found 'To somewhat extent satisfied' with the available Assistive technology facilities in the library.

Lastly, the majority of locomotor impaired users in CSL (13; 52 %), CRL (10; 40 %) and ZHL (8; 32 %) are 'Not satisfied' with the available Assistive software/hardware facilities at their institution/library. In MIPSL 7 (28 %), responded that they are 'To somewhat extent satisfied' with the available Assistive Technology facilities in the library. In DRL, 9 users (36 %) are found 'Satisfied' with the available assistive facilities for them in the institution/library.



Note: n=25 (= 100%), representative population from each Library

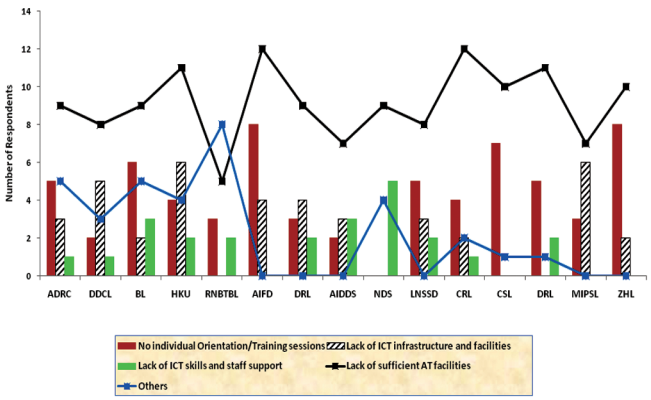
Figure 4. Satisfaction level of users towards assistive technologies.

When the research question, 'Whether there are sufficient assistive technology facilities available in the institutions/libraries for the people with disabilities?' is statistically tested, the results of Chi-square (χ^2) test, showed that people with disabilities were not satisfied with the available assistive facilities in the libraries (as P value=0.000 is < 0.05) because they were not sufficient to meet their information needs and requirements.

5.6 Barriers in Use of Assistive Technology

Although, there are many assistive technology solutions available today for the people with disabilities providing access to variety of resources in the libraries but still there are various barriers faced by them in the use of these technologies. In the earlier studies. The present study identifies the type of barriers faced by users of NCR libraries in the use of assistive technology in the modern digital environment and it is found that 'lack of sufficient AT facilities' is the major barrier among the maximum users in all the libraries except RNBTBL (i.e., 12; 48 % each in AIFD and CRL, 11; 44 % each in HKU and DRL, 10; 40 % each in CSL and ZHL, 9; 36 % each in ADRC, BL, DRL and NDS, 8; 32 % each in DDCL and LNSSD and 7; 28 % each in AIDDS and MIPSL, respectively) that restricts the users from utilising the benefits of technology.

In HKU, 16 % users reported that many books are marked with pen and pencil which is difficult to scan for recognising by the scanner as scanners are very old and not working properly. Also, computers are not updated with latest assistive technology and 'SAFA' software is installed only on one system in HKU. In ZHL (40 %) and MIPSL (28 %), the maximum respondents reported that there is no facility of 'special adjustments computers' for the users and no 'large track ball (mouse)' for people with hand difficulties is the common barrier faced by the users in all the libraries serving the locomotor-impaired users (i.e., CRL, CSL, DRL, MIPSL and ZHL, respectively). There is not a single assistive software facility available in DRL, MIPSL, and ZHL for the locomotor-impaired users.



Note: n=25, where percent exceeds 100 % as users were allowed for multiple responses

Figure 5. Various barriers faced in the use of assistive technology.

Due to the 'lack of individual orientation/training sessions', the majority of users (i.e., 8; 32 % in AIFD, 7; 28 % in CSL, 6; 24 % in BL, 5; 20 % each in ADRC, LNSSD and DRL and 4; 16 % in CRL respectively) in NCR libraries are not able to use AT effectively which is found as second major barrier preventing the access to the resources in the electronic environment. The majority of users suggested that 'Training on effective use of the assistive devices newly introduced by the library' should take place periodically in the libraries to enhance their skills and awareness to handle the latest technology and products.

The 'lack of sufficient ICT infrastructure and facilities' is also posing a great barrier in the use of AT among the many users in HKU (6; 24 %), MIPSL (6; 24 %), DDCL (5; 20 %), DRL (4; 16 %) and AIDDS (4; 12 %) respectively. There is only one computer equipped with screen reader and screen magnification software in DDCL for use by users. It is also observed that blind/vision impaired users (i.e., 8; 32 % in RNBTBL, 5; 20 % each in ADRC and BL, 4; 16 % in HKU and 3; 12 % in DDCL) 'sometimes' face difficulty in the access of web information with the help of assistive technology and find that AT like 'Screen Readers' available today are not completely compatible with the Web.

'Lack of ICT skills and staff support' in the use of assistive technologies was identified as additional barrier to access in the NCR libraries. While disability awareness is still an essential training for the library staff but now there is need for staff to know how to use assistive technology which their disabled users may require within the library.

5.7 Role of Libraries to Overcome Barriers

Technology opens the door to information access for the people with disabilities and makes the performance of the tasks easier but sometimes itself acts as a barrier[16]. Thus, in this digital age librarians need to work hard to cope up with the changing technologies and need to adopt the appropriate assistive aids/devices to meet the challenge of serving the disabled in the libraries. Today, there are numerous AT facilities available for the individuals with disabilities so there is a requirement of highly knowledgeable and skilled staff to handle these technologies[17] in the NCR libraries. Also, the lack of familiarity with electronic equipment and lack of support and training in the use of adaptive technologies are identified as the major barriers to accessibility of information[6] therefore, the necessary ICT skills need to be developed by the libraries among the disabled users by providing regular trainings and orientation programmes including seminars and practical workshops on enabling technologies. The libraries can develop different training programmes for the users with disabilities by identifying their varied information needs and demands on the basis of the type and nature of the disability they have[18]. It is often noticed that lack of assistive technology and training is due to the lack of funds in the libraries/institutions for the disability services[11]. Thus, there is need for the librarians to review and update their library policies focusing on people with disabilities with the aim to develop new plans of action for addressing the disability issues that may include the acquisition of sufficient AT facilities for the users, training of staff as well as users on how to use the assistive technology and inclusion of feedback of the potential users before acquiring any new technology in the library.

Technological advances have enabled people with a wide range of disabilities to use computers and the internet, but there is need to follow some standards in this regard[19] like the Web Accessibility Initiative (WAI) guidelines which are considered the International standard for web accessibility. So, librarians can refer to guidelines established by the World Wide Web Consortium (W3C), a well-known sponsor of global web development[19] and the standards setting body of the internet[20] to learn how to make web content easily accessible to the people with disabilities as these guidelines mainly focus on the accessibility issues related to the content available through the web. UNESCO and IFLA have issued guidelines to provide equal library services to all including people with disabilities. Government of India and University Grants Commission have also issued guidelines in this regard.[21]

6. CONCLUSIONS AND SUGGESTIONS

The assistive technology plays an important role in the lives of the people with disabilities as it enhances information access and allows the user to accomplish their tasks in a more refined manner independently. The people with disabilities in the NCR libraries of India 'Strongly agree' towards

the need of the assistive technologies to work in the digital environment. Although there are some useful AT facilities like JAWS, SAFA, Kurzweil Reader and Zoom Text Magnifier/Reader which are available in all the libraries serving the blind/ vision impaired users but majority of users do not find them sufficient and are 'Not satisfied' with the available Assistive software/hardware facilities at their institution/library. Also, majority of deaf/ hearing-impaired and locomotor-impaired responded that there is lack of sufficient assertive technology facilities at their institution/library. It is also observed through this study that some NCR libraries are not concerned at all regarding the needs of such user group and providing negligence amount of AT facilities to them. Finally the research study depicts that most of the NCR libraries of India are not in a position to serve the information needs of people with disabilities due to lack of sufficient AT(Assistive Technology) devices and technical barriers to handle these devices by the librarians and the users. Therefore, before providing the services to the users, the librarians must be trained to handle the various assistive technologies and should learn to communicate with the different types of the disabled people.

Due to the rising complexities in the technologies, the libraries of future are tasked with an enormous amount of responsibility therefore the development of an effective communication network between the creators of information and the end users will prove beneficial in adopting the new technologies by the libraries in modern digital environment. An exhaustive research on the 'role of assistive technology in the lives of people with disabilities' can be done which can help to explore the types of assistive aids/devices required by the people with disabilities on the basis of the degree of disability suffered by them. The detailed study of the 'compatibility of the available assistive softwares for the blind/ vision-impaired people with the web' can help the libraries in selecting the suitable software for the users which can reduce the technical barriers faced by the blind/vision impaired users during the access of the Web.

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