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BARRIERS IN USING ICT DEVICES AMONG VISUALLY IMPAIRED STUDNETS

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Abstract

The purpose of this study was to assess the utilization of ICT enabled devices and identifying barriers in the usage of ICT enabled devices faced by visually impaired students. Exploratory approach has been adopted in which interview schedule is used to collect information. Self structured and standardized schedule was used to collect data regarding assessment of utilization of ICT enabled devices and identifying barriers in the usage of ICT enabled devices among visually impaired students. Respondents were selected from Dr. Shakuntala Mishra National Rehabilitation University, the only university offering higher education to differently abled students in Lucknow. The data was collected purposively form visually impaired students pursuing higher education. Gender, age and family background were selected to assess the influence on the use of ICT devices. Thus the study aimed to find out the kind of ICT enabled devices are being used by male and female respondents, respondents having rural and urban background and respondents from different age group of 18 years to 35 years. Findings regarding the use of ICT related technologies emphasized that female respondents are more active in using ICT enabled services than male respondents. Among all the ICT devices, mobile phone was most used device among 18-23 and 30-35 years of respondents as it helped them to communicate easily. As far as barriers in the usage of mobile phones were concerned, majority of the respondents complained about speech software problem whereas respondents having rural

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background prefer to use screen reader software than respondents of urban area. From the study it may also be inferred that visually impaired are not very comfortable in using smart cane as it creates many barrier such as, unable to recognize the pit, low or absence of vibration, unable to detect right or wrong side obstacle and creates confusion in enclosures. Thus this study will add valuable knowledge to existing literature regarding barriers faced by visually impaired in using ICT devices.

Keywords: barrier;Technology;Information &communication technology;Visually Impaired;

1. Introduction

ICT (Information and Communication Technologies) is defined as a "Diverse set of technological tools and resources used to communicate, and to create, disseminate, store and manage information" **(Blurton, 1999).** ICT has become a very important part of the educational delivery and management processes. ICT to a great extent facilitates the acquisition and absorption of knowledge, and hence can provide extraordinary opportunities to developing countries for enhancing their educational systems particularly for the underprivileged constituency, and thereby for raising the level of quality of life of their people. The new communications technologies promise to reduce the sense of isolation, and open access to knowledge in ways unthinkable, not long ago **(Mishra et al., 2010).**

The word ***disability*** indicates human limitation of one kind or other, in performing various tasks performed by other human beings in general. It may be one or more of the kind of physical, mental or sensory, including visual and hearing. Generally people with disability automatically become underprivileged, because they may not have proper access to the recourses, accessible otherwise. Persons with disabilities include those who have long-term physical, mental, intellectual or sensory impairments, which, in interaction with various barriers, may hinder their full and effective participation in society on an equal basis with others **(Mishra et al., 2010).**

Access to ICT for visually-challenged students may require more resources than are provided for other differently-abled students. It has impacted greatly in education for visually-challenged

in a number of ways. They are electronic technologies used for accessing processing, gathering, manipulating and presenting or communicating information. The introduction of ICT in education accelerates, enriches and deepens basic skills in reading, writing and it can motivate and engage students to learn as they become more independent and responsible for their learning. Moreover, ICT helps to encourage students to become active participants in social, cultural, and economic development. ICT can be multi-media for instructional delivery. It can be delivered in textual, audio, visual, and audiovisual forms **(Soman& Sudhier, 2015).**

Information and communication technology (ICT) provides many opportunities for social inclusion. The ICT offers great benefits to people with disabilities and enables them to participate equally in social, cultural and economic development. ICT can enable them to improve their quality of life and to live in much the same way as those who are not disabled. They can accomplish tasks that would be impossible to do without ICT. However, the prospective promised with the ICT often has not the reality for most people with disabilities. They had been kept away from the mainstream society, denominating them as disabled. At present, the term disabled is no more prevalent; instead of it, words like differently abled or visually-impaired are used. It is important to recognize that visually-impaired may have counterbalancing strengths in other areas too **(Haneefa& Syamili, 2014).**

Several studies were related to use of ICT devices for visually impaired such as, Soderstrom and Ytterhus 2009; Bocconi, et al. 2007; Lucky and Achebe 2013; Van Puffelen 2009. However most of the analyzed research focused on information service delivery for visually impaired and use of assistive and communication technologies. Lucky and Achebe **(2013)** indicated that persons with visual impairment have been rendered special attention to fully participate in the world by providing them with best possible support necessary to bridge gaps between accessibility and literacy. More importantly career in science are now within the reach of the visually impaired and some of them have become successful in information service. Soderstrom and Ytterhus **(2009)** revealed that partially sighted young people have the possibility of accessing ICT without using assistive technology and their access and use may be considerably limited without the assistive technology, with the result that they may become less efficient users of ICT. They also commented that young blind people do not have the luxury of rejecting ICT

assistive technology if they want to participate in the community of their peers. Bocconi, et al. **(2007)** in their study emphasized that great majority of the needs of visually impaired students is covered by the law provisions: alternative keyboard navigation is required in that it is essential for people with visual impairment who cannot fully rely on pointing devices such as a mouse ; the preservation of the basic accessibility features provided by operating systems is requested, including the maintenance of a number of features which are fundamental for low vision users such as the possibility of enlarging characters, reversing the color scheme, setting color brightness and contrast, increasing the contrast between text and background. Van Puffelen **(2009)** showed that www is used by 97.3% of the young people against 71% of the elderly and the younger respondents perceived their skills, except for the use of email, higher than the elderly. The majority of the elderly respondents (71.4 %) learned to go online and using email from receiving computer training whereas 80.3% of the younger people learned these internet activities themselves.

Although increasing number of studies on barriers faced by visually impaired have been published but limited studies are conducted on barriers in using ICT enabled services by visually impaired. In one of the studies, a highly configurable word processing environment by using a pragmatic, obstacle-by-obstacle approach to alleviating some of the visual problems encountered by dyslexic computer user was developed. They counted eleven visual difficulties associated with dyslexia such as short memory, pattern glare, motor control, spell checking, visual memory, word recognition, poor comprehension, and letter reversals. They altered several features of the visual environment of the software including spacing, font, synthesized speech, and character typeface among others **(Dickinson et al., 2002)**.

Fuglerud **(2011)** focused on barriers to and benefits of use of ICT for people with visual impairment, conducted a focus group interview and a field study. Researches on use of internet services, mobile phones, kiosks, ticket machines, ATMs, and queuing management systems and pointed out that several commonly used ICT services, such as online banking, electronic forms, and learning material were found to have major accessibility problems.

Therefore the purpose of the study was investigating the barriers in using ICT devices among persons with visual impairment. More specifically the aim of present study was assessment of utilization of ICT enabled services for visually impaired and identifying barriers in the usage of ICT enabled services.

Objective

The main objective of this study was to investigate the use of ICT devices by the visually-impaired students in Lucknow district. To fulfill this aim, the following specific objectives were identified:

1. To assess the utilization of ICT enabled devices for visually impaired students.

2. To identify barriers in the usage of ICT enabled devices by visually impaired students.

Rationale of the Study

India has one of the largest disabled populations in the world. It was estimated that approximately 2.21 percent of India's total population or 2.69 crore are disabled as per census 2011. However 18.8 percent or approximately 50 lakh people are affected with visual impairment as per 2011 census. They are left out of mainstream education and employment opportunities and are unable to lead a life of inclusion, independence and dignity. In the information society, fulfillment of all other rights, such as education, employment, recreation, access to public information, etc are inextricably interwoven with access to electronics and information and communication technologies (ICTs). This is especially so in the context of persons with visual impairment, since many of them depend solely upon the availability of assistive technology and communication technology to access information. Information and communication technology (ICT) is playing an important role in changing the living conditions of many people with visual impairment during the past decades. However, it is affecting the way people work, learn, shop, recreate, and communicate with others. At the same time, these technologies hold great promise for people with disabilities since they have the potential to eliminate (or at least reduce) many of the disabling barriers that impair or completely prevent them from participating in many activities. The variety of obstacles they may find on their way is quite large mainly because the term “visually impaired” encompasses a wide range of deficits, ranging from blindness to a number of other multifaceted, although less severe, visual

impairments. The development of the Internet has made possible unprecedented access to information. A few years ago, only paper copies of newspapers were available; now people can choose to read news in print, online, on a cell phone, and so on. Visually impaired individuals can use text-to voice applications to listen to the news or subscribe to podcasts. The Web has also provided access to new sources of updated information that cater specifically to the necessities of people with disabilities. Thus the study aimed to assess the utilization of ICT enabled devices and identifying the barriers in the usage of ICT enabled devices by for persons with visual impairment.

Methodology

Utilization of ICT enabled devices and identifying barriers in the usage of ICT enabled devices among visually impaired students, was assessed. A broad and exploratory approach in which interview method was used to collect information. The possibility to go in-depth on the experiences and individual challenges of the participants' in everyday life, and also the possibility to bring to light issues and topics that were not known in advance was studied.

In the present study, self structured and standardized questionnaire was used to collect data regarding assessment of utilization of ICT enabled devices and identifying barriers in the usage of ICT enabled devices among visually impaired students. Respondents were selected from Dr. Shakuntala Mishra National Rehabilitation University, Lucknow, the only university of higher education in Lucknow. The data was collected purposively form visually impaired students pursuing higher education. The present study is focused on exploring the influence of independent variables as gender, age and family background. Thus the study aimed to find out the kind of ICT enabled devices being used by male and female respondents, respondents having rural and urban background and respondents from different age group of 18 to 40 years. The study is also focused on identification of barriers in the utilization of various communication and assistive technology among students with visual impairment.

In the line of above, visually impaired students are from a heterogeneous group. They use a variety of ICT and assistive technology depending on the degree of their impairment. People who are completely blind typically use screen readers, mobile with JAWS software, laptop,

smart cane etc. A screen reader converts the text on a computer screen into braille or into spoken words using a synthesized voice. People who are partially sighted often use screen magnifier software. With screen magnifier software the user can take a small area of the computer screen and make it larger. Screen magnifiers also let users invert or adjust colors and contrast in order to support their type of sight loss in an optimal way. Thus there was more scope to know about kind of devices used and the barriers they are facing while using these technologies. Sampling technique adopted in the present study is multistage purposive and simple random sampling technique. The data was coded, tabulated and analyzed using the PAS software (version 20). Statistical analysis was done using 't' test and frequency percentage method. 'T' test was used for statistical analysis of questions regarding assessment of utilization of ICT enabled services using independent variables as gender (Male/Female) and family background (Rural/Urban). Frequency and percentage method was used to calculate multiple choice questions regarding obstacles faced by visually impaired in the usage of ICT enabled services.

RESULTS AND DISCUSSION

Table1: Use of ICT and Assistive Devices by Students with Visual Impairment across the gender

S.No	Items	Male	Female			'T' value	'P' value
		Mean	SD	Mean	SD		
1.	Use of mobile phones	1.00	0.00	1.21	0.55	1.69**	0.00
2.	Use of JAWS software	1.57	0.67	1.97	0.56	2.24*	0.02
3.	Use of computers/ Laptops	1.67	0.79	1.90	0.81	0.99	0.87
4.	Use of tactile devices	1.29	0.64	1.21	0.55	0.46	0.39
5.	Use of screen readers.	1.57	0.67	1.52	0.82	0.24	0.26
6.	Use of radio	1.19	0.60	1.76	0.95	2.41**	0.00
7.	Use of tape recorders.	1.29	0.64	1.79	0.86	2.27*	0.01
8.	Use of smart cane	1.57	0.50	1.83	0.60	1.58	0.69
9.	Use of ABACUS	1.14	0.47	1.31	0.66	0.98*	0.05

10.	Use of Braille Slate	1.43	0.74	1.79	0.94	1.47*	0.01
11.	Use of tracing wheel	1.67	0.65	1.97	0.86	1.32	0.15
12.	Use of Braille Kit	1.38	0.80	1.90	0.97	1.98*	0.01
13.	Use of Jerman Slate	1.19	0.51	1.52	0.57	2.07*	0.01
14.	Use of talking computer terminal.	1.57	0.50	2.21	0.62	3.85	0.97
15.	Use of kurzweil reading machine	1.90	0.54	2.34	0.67	2.48*	0.02
16.	Use of optacon.	2.00	0.31	2.00	0.00	0.00	0.09
17.	Use of computer driven Braille printer.	2.14	0.65	2.17	0.60	0.16	0.77
18.	Use of paperless Braille machine.	2.10	0.53	2.10	0.55	0.05	0.82
19.	Use of talking books/ DAISY books	1.10	0.43	1.97	0.90	4.06**	0.00
20.	Use of dictation devices and description.	1.52	0.81	1.72	0.84	0.84	0.63
21.	Use of standalone reading machine	2.05	0.74	2.45	0.50	2.27	0.58
22.	Use of Braille translation software	2.24	0.62	2.41	0.50	1.10	0.73
23.	Use of text to speech software	2.00	0.77	2.14	0.74	0.63	0.86
24.	Use of book scanner and software	1.86	0.36	2.03	0.42	1.56	0.63
25.	Use of Braille watch	1.62	0.74	2.45	0.68	4.08	0.65
26.	Use of white cane	1.14	0.36	1.34	0.48	1.61**	0.00
	Total _use	**43.2**	**4.93**	**51.0**	**8.07**	**3.92**	**0.17**

Table 1 is concerned with the use of ICT related and assistive technologies used by students with visual impairment. 'T' statistics has been calculated to test the significant difference between male and female respondents. From the above table, mean and SD values of male and female respondents were compared. Significant differences can also be interpreted from above data. The above table consists of many ICT devices and services such as mobile phones, JAWS software, computer/laptop, radio, television, screen reader, tape recorder, DAISY books, text to speech software, book scanner software, talking computer terminal, kurzweil reading machine, dictation devices and description, standalone reading machine and computer driven Braille printer. Results obtained from table 1 shows highly significant differences between male and female respondents

in the usage of mobile phones, radio and DAISY books. From the mean and SD values, it may also be interpreted that female respondents are more interested in using ICT devices than male respondents. Female respondents scored mean value as 1.21, 1.76 & 1.97 which more than male respondents mean and SD value 1.00, 1.19 & 1.10. Results obtained from the above table also show significant differences between male and female respondents as far as usage of JAWS software, tape recorder and kurzweil reading machine are concerned.

On the other hand, some assistive devices like ABACUS, Braille slate, Braille Kit, Jerman Slate and white cane, being used by students with visual impairment, were also studied. Results indicate significant difference between male and female respondents because these items scored p value between 0.01 to 0.05.Thus from the table it can be interpreted that female respondents are more active in using ICT devices. Results of a similar study conducted by **Nanda and Ramesh (2012)** emphasizes that ICT provides an effective mode of communication with professionals and they are well acquainted with the assistive technologies in some extent.

Table2: Use of various ICT and assistive devices across age

S. No	Items	Age (N=50)			Total (N=50)
		18-23 (N=24)	24-29 (N=19)	30-35 (N=7)	
1.	mobile phones	22 (91.7)	17 (89.5)	7 (100)	46 (92)
2.	JAWS software	7 (29.2)	5 (26.3)	4 (57.1)	16 (32)
3.	computers/ Laptops	11 (45.8)	7 (36.8)	4(57.1)	22 (44)
4.	tactile devices	18 (75)	17 (89.5)	7 (100)	42 (84)
5.	Screen readers.	17 (70.8)	8 (42.1)	6 (85.7)	31 (62)
6.	Radio	18 (75.0)	13 (68.4)	5(71.4)	36 (72)
7.	tape recorders	12 (50)	13 (68.4)	6 (85.7)	31 (62)

8.	**smart cane**	7 (29.2)	9 (47.4)	1 (14.3)	17 (34)
9.	**ABACUS**	19 (79.2)	16 (84.2)	7 (100)	42 (84)
10.	**Braille Slate**	14 (58.3)	13 (68.4)	4 (57.1)	31 (62)
11.	**tracing wheel**	10 (41.7)	8 (42.1)	2 (28.6)	20 (40)
12.	**Braille Kit**	13 (54.2)	14 (73.7)	5 (71.4)	32 (64)
13.	**Jerman Slate**	12 (50)	15 (78.9)	6 (85.7)	33 (66)
14.	**talking computer terminal**	4 (16.7)	6 (31.6)	2 (28.6)	12 (24)
15.	**kurzweil reading machine**	1 (4.2)	4 (21.1)	2 (28.6)	7 (14)
16.	**computer driven Braille printer**	1 (4.2)	2 (10.5)	3 (42.9)	6 (12)
17.	**paperless Braille machine**	1 (4.2)	2 (10.5)	2 (28.6)	5 (10)
18.	**talking books/ DAISY books**	11 (45.8)	17 (89.5)	4 (57.1)	32 (64)
19.	**dictation devices and description**	9 (37.5)	17 (89.5)	3 (42.9)	29 (58)
20.	**standalone reading machine**	1 (4.2)	4 (21.1)	0.0	5 (10)
21.	**Braille translation software**	0.0	1 (5.3)	1 (14.3)	2 (4)
22.	**text to speech software**	9 (37.5)	1 (5.3)	2 (28.6)	12 (24)
23.	**book scanner and software**	3 (12.5)	1 (5.3)	1 (14.3)	5 (10)
24.	**Braille watch**	3 (12.5)	9 (47.4)	2 (28.6)	14 (28)
25.	**white cane**	17 (70.8)	15 (78.9)	5 (71.4)	37 (74)

The usage of various ICT and assistive devices by using across various age groups was studied. To carry out the present research, age is grouped in three categories (18-23), (24-29) and (30-35) years. Results indicate that mobile phone is most popular device among the respondents of 18-23 years. 91.7 percentage of respondents use mobile phones of this age group whereas all the respondents of 30-35 years group use mobile phones. Approximately 89.5 percentage respondents use mobile phone from the age group of 24-29. As above table indicates usage of ICT devices among the various age groups of respondents, 75 percentage and 71.4 percentage respondents use radio from the age group of (18-23) and (30-35) respectively. As far as usage of computer and laptop are concerned, 57.1 percentage respondents use it from the age group of 30-35. Some assistive technologies are also used by respondents but remain same as the age of the respondents increase the influence of ICT and assistive technologies decreases. Text to speech technologies will enable the visually impaired persons and illiterate, semiliterate to communicate and to access news, information and e-services in audio format **(USOF, 2011).**

Table3: USE OF ICT AND ASSISTIVE DEVICES BY STUDENTS WITH VISUAL IMPAIRMENT ACROSS THE FAMILY BACKGROUND)

S.No	Items	Mean		Standard Deviation		'T' value	'P' value
		Rural	Urban	Rural	Urban		
1.	Use of mobile phones	1.13	1.11	.492	.323	.107	.741
2.	Use of JAWS software	1.78	1.83	.659	.618	.274	.509
3.	Use of computers/ Laptops	1.81	1.78	.821	.808	.144	.865
4.	Use of tactile devices	1.19	1.33	.535	.686	.835	.133
5.	Use of screen readers.	1.66	1.33	.865	.485	1.455	.000
6.	Use of radio	1.50	1.56	.880	.856	.216	.941
7.	Use of tape recorders.	1.38	1.94	.707	.873	2.511	.174
8.	Use of smart cane	1.59	1.94	.499	.639	2.154	.467
9.	Use of ABACUS	1.22	1.28	.553	.669	.336	.462
10.	Use of Braille Slate	1.53	1.83	.842	.924	1.176	.362

11.	Use of tracing wheel	1.78	1.94	.832	.725	.696	.096
12.	Use of Braille Kit	1.78	1.50	.975	.857	1.021	.036
13.	Use of Jerman Slate	1.38	1.39	.609	.502	.082	.599
14.	Use of talking computer terminal.	1.94	1.94	.716	.539	.036	.123
15.	Use of kurzweil reading machine	2.22	2.06	.659	.639	.849	.334
16.	Use of optacon.	2.03	1.94	.177	.236	1.476	.413
17.	Use of computer driven Braille printer.	2.25	2.00	.718	.343	1.386	.000
18.	Use of paperless Braille machine.	2.16	2.00	.677	.000	.974	.000
19.	Use of talking books/ DAISY books	1.47	1.83	.803	.924	1.460	.175
20.	Use of dictation devices and description.	1.78	1.39	.870	.698	1.638	.049
21.	Use of standalone reading machine	2.41	2.06	.665	.539	1.909	.008
22.	Use of Braille translation software	2.44	2.17	.564	.514	1.680	.038
23.	Use of text to speech software	2.06	2.11	.759	.758	.217	.961
24.	Use of book scanner and software	1.88	2.11	.336	.471	2.058	.376
25.	Use of Braille watch	2.09	2.11	.818	.832	.072	.928
26.	Use of white cane.	1.16	1.44	.369	.511	2.302	.000
	Total use	47.59	47.94	8.515	6.898	.149	.460

Table 3 presents the use of ICT and assistive devices by the respondents of rural and urban background. Assistive Technology is specialized hardware or software that provides users with an alternative format to communicate and access information and educational resources **(Nanda**

&Ramesh 2012). 'T' test has been calculated to compare mean value of the rural and urban respondents. From the table, it may be interpreted that respondents having rural background prefer to use screen reader than respondents of urban background. Significant difference exists in the usage of screen reader software as respondents of rural background scored mean value 1.66 whereas respondents of urban background scored 1. 33 and 'p' value is 0.00. Similar results were found in the usage of computer driven braille printer, white cane, paperless Braille machine and stand alone reading machine. Significant differences were found in the usage of these devices. On the other hand respondents who are partially sighted, have possibility of accessing ICT without using assistive technology and their access and use may be considerably limited without the assistive technology, with the result that they may become less efficient users of ICT. On contrast, young blind people do not have the luxury of rejecting ICT assistive technology if they want to participate in the community of their peers (**Soderstrom & Ytterhus, 2009)**.

BARRIERS IN THE USAGE OF ICT ENABLED SERVICES BY FOR PERSONS WITH VISUAL IMPAIRMENT USING ACROSS THE GENDER, AGE AND FAMILY BACKGROUND

Table4: Problems in the usage of mobile phones

S. No	Items	Gender		Area of domicile		Age		
		Male (N=21)	Female (N=29)	Rural (N=32)	Urban (N=18)	(18-23) N=24	(24-29) N=19	(30-35) N=7
1.	problem in the speech software	6(28.6)	10(34.5)	8 (25)	8 (44.4)	7 (29.2)	8 (42.1)	1 (14.3)
2.	low battery back up	5 (23.8)	8 (27.6)	11 (34.4)	2 (11.1)	7 (29.2)	2 (10.5)	4 (57.1)
3.	talk back is slow	2 (9.5)	4(13.8)	6 (18.8)	0.0	4 (16.7)	2 (10.5)	0
4.	screen reader	2 (9.5)	1 (3.4)	2 (6.2)	1 (5.6)	2 (8.3)	1 (5.3)	0

	quality is not good							
5.	problem with JWAS software	3 (14.3)	2 (6.9)	1 (3.1)	4 (22.2)	3 (12.5)	1 (5.3)	1 (14.3)
6.	all of the above	3 (14.3)	2 (6.9)	4 (12.5)	1 (5.6)	1 (4.2)	3 (15.8)	1 (14.3)
7.	none of the above	0	2 (10.5)	0	2(11.1)	0	2 (10.5)	0

Table 4 is concerned with problems in the usage of mobile phones between male and female respondents. From the table it is very clear that 34.5% female respondents have problem with speech software in the mobile phones which is comparatively higher than males. Another problem related to mobile phone is low battery backup. Approximately 27.6 % female respondents reported low battery backup problem. 42.1 percent of respondents of 24-29 years face problem in speech software which is comparatively higher than other age group. 57.1 percent respondents in the age group of 30-35 reported that they face low battery backup problem. Only 8.3 percentage respondents complained that screen reader quality is not good. The results about family background indicate that 44.4 percent respondents having urban background face problem in the speech software.

Table5: Problems in the usage of Laptop

S. No	**Items**	**Gender**		**Area of domicile**		**Age**		
		Male (N=21)	**Female (N=29)**	**Rural (N=32)**	**Urban (N=18)**	**(18-23) N=24**	**(24-29) N=19**	**(30-35) N=7**
1.	ill functioning of keys	6 (28.6)	5 (17.2)	9 (28.1)	2 (11.1)	4 (16.7)	4 (21.1)	3 (42.9)
2.	low battery back	2 (9.5)	1 (3.4)	0	3 (16.7)	1 (4.2)	2 (10.5)	0

	up							
3.	problem in the programming	7 (33.3)	6 (20.7)	9 (28.1)	4 (22.2)	7 (29.2)	4 (21.1)	2 (28.6)
4.	all of the above	5 (23.8)	10 (34.5)	10 (31.2)	5 (27.8)	8 (33.3)	5 (26.3)	2 (28.6)
5.	none of the above	1 (4.8)	7 (24.1)	4 (12.5)	4 (22.2)	4 (16.7)	4 (21.1)	0

From the table 5, it can be interpreted that respondents with visual impairment face difficulty while operating laptop. Focusing on gender, it was found that male respondents face more problem than female respondents in using laptop. As far as usage of laptops and computers are concerned, 42.9 percent respondent from the age group of 30-35 complained about ill functioning of keys.

In this study, respondents were both from rural and urban background and the results revealed that respondents from rural background face more difficulty in operating laptops than urban respondents. **Dobransky& Hargittai (2006)** conducted a similar study and argues that there is, indeed, a disability divide that needs to be taken into consideration when discussing digital inequality. Whether it is in terms of access to or use of computers and the Internet, many people with disabilities lag behind those without such impairments.

Table6: Problems in the usage of smart cane

S. No	**Items**	**Gender**		**Area of domicile**		**Age**		
		Male (N=21)	**Female (N=29)**	**Rural (N=32)**	**Urban (N=18)**	**(18-23) N=24**	**(24-29) N=19**	**(30-35) N=7**
1.	unable to recognize the pit	5 (23.8)	1 (3.4)	4 (12.5)	2 (11.1)	2 (8.3)	4 (21.1)	0
2.	low or absence	2 (9.5)	3	5	0	2 (8.3)	3	0

	of vibration		(10.3)	(15.6)			(15.8)	
3.	unable to recognize obstacle at eye/head level	2 (9.5)	4 (13.8)	4 (12.5)	2 (11.1)	3 (12.5)	1 (5.3)	2 (28.6)
4.	unable to detect right or wrong side obstacle	1 (4.8)	5 (17.2)	3 (9.4)	3 (16.7)	5 (20.8)	1 (5.3)	0
5.	creates confusion in enclosures (do not recognize when there are many obstacle at a point/room)	1 (4.8)	3 (10.3)	4 (12.5)	0.0	1 (4.2)	1 (5.3)	2 (28.6)
6.	All of the above	4 (19)	4 (13.8)	4 (12.5)	4 (22.2)	5 (20.8)	1 (5.3)	2 (28.6)
7.	none of the above	6 (28.6)	9 (31)	8 (25)	7 (38.9)	6 (25)	8 (42.1)	1(14.3)

Smart cane is a device for blind which detect obstacle and give indication of obstacle but this device has some drawback as the above table indicates. The limitations of this device is that is unable to recognize the pit, low or absence of vibration, unable to recognize obstacle at eye/head level, unable to detect right or wrong side obstacle and sometimes creates confusion in enclosures. Approximately 25 percent male respondents faced problem in recognizing the pit which is more than female. Difference was not very high regarding other problems of this device between male and female respondents. Approximately thirty percent respondents from the age group of 30-35 reported that they were unable to recognize obstacle at eye/head level and the

device creates confusion in enclosures (do not recognize when there are many obstacle at a point/room).

From the table, it is very clear that respondents having rural background face more problem than respondents from urban area in using the device.

Table7: Problems in the usage of talking books

S. No	Items	Gender		Area of domicile		Age		
		Male (N=21)	Female (N=29)	Rural (N=32)	Urban (N=18)	(18-23) N=24	(24-29) N=19	(30-35) N=7
1.	accent/language problem	9 (42.9)	8(27.6)	9 (28.1)	8 (44.4)	3 (12.5)	10 (52.6)	4 (57.1)
2.	unavailability of language translation	4 (19)	4 (13.8)	5 (15.6)	3 (16.7)	6 (25)	2 (10.5)	0
3.	both of the above	5 (23.8)	11 (37.9)	14 (43.8)	2 (11.1)	11 (45.8)	2 (10.5)	3 (42.9)
4.	none of the above	3 (14.3)	6 (20.7)	4 (12.5)	5 (27.8)	4 (16.7)	5 (26.3)	0

Table7 focused on problems in the usage of talking book. Male respondents (42.9%) faced accent and language problem in using talking books, nineteen percent male respondents complained about unavailability of language translation which is comparatively higher than female. The above table clearly reveals that approximately 43 percent respondents in the age group of 30-35 faced both accent/language problem and unavailability of language translation. As far as family background is concerned respondents from rural area face more problem than respondents from urban area.

Conclusion:

This study has clearly demonstrated that there are great extent of difficulties for blind people in using ICT enabled services. Difficulties are in terms of handling, accessing, operating and using assistive and communication technologies. Results regarding the use of ICT related technologies emphasize that female respondents are more active in using ICT enabled services than male respondents. Among all the ICT devices, mobile phone is being used maximum by the respondents in the age group 18-23 as it helps them to communicate easily. Some problems were also reported by respondents in using mobile phones is; problem in JAWS software, speech software, low battery backup and problem of slow talk back. On the other hand, results also indicate that respondents having rural background prefer to use screen reader software than respondents of urban area. People with visual impairment face a lot of difficulty in using smart cane as it is not found to be user friendly and involve hurdles in using such as unable to recognize the pit, low or absence of vibration, unable to detect right or wrong side obstacle and creates confusion in enclosures. Male respondents were less comfortable in using this device than female respondents. Approximately thirty percent respondents from the age group of 30-35 faced problem in detecting obstacle at eye/head level.

Majority of the respondents of 18-23 years face problem in recognizing right or wrong side obstacle while other age group do not prefer to use this device due to various problems. On the whole it can be concluded that this research is very helpful in identifying barriers in using communication and assistive technologies among visually impaired. This study will also add literature in customizing need based devices that can create barrier free environment and can improve the quality of life of persons with visual impairment.

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