

Study of Information and Communication Technology (ICT) Literacy among Visually Impaired Students

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Abstract: *The aim of the study is to study and understand the Information and communication technology (ICT) related technical abilities among visually impaired students based in Delhi. Research is done by utilising the mixed methods research approach for the quantitative study likert scale and checkbox questions used for qualitative study open ended question and semi structured interview is done. A convenience and sampling technique was used to select 20 visually impaired students of higher education who have done or are pursuing higher education courses from Delhi. The collected data was analysed. The study found that all students are using an android phone, many of them have laptops. Almost all of them know the basic operation skills, where very few of them have basic knowledge of advanced skills like audio editing skill or PPT making skill, they have also discussed challenges associated with different software and software updation. This study gives us insight of ongoing challenges and tentative solutions of these challenges associated with the technical dimension of the assistive technologies used by visually impaired students.*

Keywords: visually - impaired students, Information and communication technology (ICT), ICT skill, assistive technology.

1. Introduction

The phrase "information and communication technologies" started appearing initially in the decade of the 1970s. (William Melody et al.1986.)

Information and communication technologies have the capability to provide many benefits to people with disabilities, it enables them and makes them capable to participate and perform on a satisfactory level in the social, cultural and economic developments. ICT have the capability to improve their quality of life. (Arrigo, M.2005)

IT based systems are having great influence on delivering content to students and effected teaching and learning processes rapidly. The almost exponential development in the arena of Information and Communication Technology (ICT) makes it faster from the past few decades. Because of this the requirement and the method of future education is also continuously changing. ICT based.

Skill of completing homework/projects independently is the key which could give the sense of independence and strength among differently abled students. These skills give capability to perform better in the academic and professional sector. Knowledge has become the most critical resource for social and economic development (Hakkarainen et al., 2000)

Rationale:

The number of visually impaired people in India is estimated as more than 62 million; of these, 54 million persons have low vision, and 8 million are blind. India is home to over 20 percent of the world's blind. (Pascolini D, Mariotti SP.2012).

Because of COVID - 19 situation we are also facing a paradigm shift in the area of education, and at this time ICT skills are more important and necessary than ever before.

Preparation of assignment and project work have become very challenging because it is very difficult for visually challenged to find writer and scribe. The only thing which can address this problem is technological assistance and skill to operate that technology.

Number of visually impaired people who are using ICT tools is increasing though many of them are facing difficulty during the use of ICT tools, the main reason behind this is lack of basic ICT skills, lack of training and (UNESCO, 2009).

The primary purpose of this study is to understand ICT related technical abilities among visually impaired students, the problems they encounter during use of these skills. And suggest appropriate ways to tackle these hurdles.

Research questions:

What are the main ICT related tools used by visually - impaired students for different purposes?

According to visually impaired students which technical abilities they have?

Which kind of challenges visually - impaired students face while using these tools?

Objective:

- To Assess the use of ICT for different purposes by the visually - impaired students.
- To find out ICT related technical abilities among visually impaired students.
- To find out common challenges faced by visually impaired students while using these tools.

Delimitations:

- 1) Only higher education pursuing visually impaired students was part of this study. .
- 2) The study is entirely done upon learners based in Delhi for their studies.

Limitations

- 1) The sample truly does not represent the entire visually impaired student population.
- 2) No real testing of technical abilities was possible, so the researcher has to depend on the response provided by the respondents.

2. Review of the Related Literature

Ferreira - Meyers, K., & Pitikoe, S. (2021) found that devices are not compatible enough to cater all the educational needs for COVID - 19 emergency blended learning and teaching. They also said that intensive Moodle training for visually impaired learners is required.

Jitjakool (2010) did a study titled, "Communications Through the Internet of the Visually Impaired". In the study he tried to examine the behaviour related to the use of the Internet by the visually impaired and tried to understand their needs and wants as well as the problems and obstacles they faced during use of the internet.

Dobranksy and Hargittai (2006) mention very clearly that technical accessibility problems are the extra barriers for the people with visual impairment which is the prime need of the time to tackle.

Jones, (2004) recommends in his study related to 'access and use of web by visually impaired students', that web - site designers have to be very sensitive, cautious and aware about the specific needs of the people with visual impairment when preparing different information sites.

Burzagli et al. (2004) Students with disabilities may, in fact, face relevant difficulties in terms of both "accessing and in using" electronic learning tools and This setback arises because many of the different learning education institutions cannot boast of sufficient professional and devices capable of tapping into the potentials of the students with visual impairments;

Fichten, et al. (2000) did a study and found that most of the software used by visually - impaired students is able to read text on the screen, some of these software can also read icons and menu bars, tabs etc.

3. Methodology

Research methodology is a specific procedure used for collecting, measuring and analysing the related data to the topic.

Research method: Survey method of research is followed.

Research approach: Mixed research approach.

Research design: Concurrent embedded design (QUAN+qual).

Study area: The study is confined to Delhi.

Population: Visually impaired students who have been enrolled in university/colleges/institutes of Delhi for higher education/ diploma courses.

Sample size: 25 samples with identical concurrent sampling for QUAN+qual. All 25 respondents participated in the qualitative and quantitative process of data collection.

Sampling design: Mix - Method Identical concurrent sampling design.

Sampling Scheme: Non - Random Convenience Sampling.

Pilot study: Pilot study was done with 5 respondents responses received, ambiguity and repetition in the questionnaire was corrected, irrelevant questions were eliminated.

Tools Applied:

Tool 1 - checklist was used to know Readiness and accessibility of students for different ICT devices and their basic

Tool 2 - 5 point likert scale to understand content production competency skill and online safety skill.

Tool 3 - semi structured interview schedule is used to know the challenges faced by visually impaired students while using ICT based technological tools.

Tool 4 - open ended questions for further suggestions.

Validation of Tool:

The tools were firstly discussed and changes were made as per suggestions given by the experts.

Data analysis Method

Qualitative and quantitative data of this study was firstly segmented then compiled in the Microsoft Excel sheet and Google sheet, codified and analysed and discussed accordingly.

4. Results and Discussion

Personal and Demographic details of Respondent:

Total number of respondent - 25

1) Gender:

Male - 18

Female - 7

2) Age group:

18 - 25 year - 20 Respondents

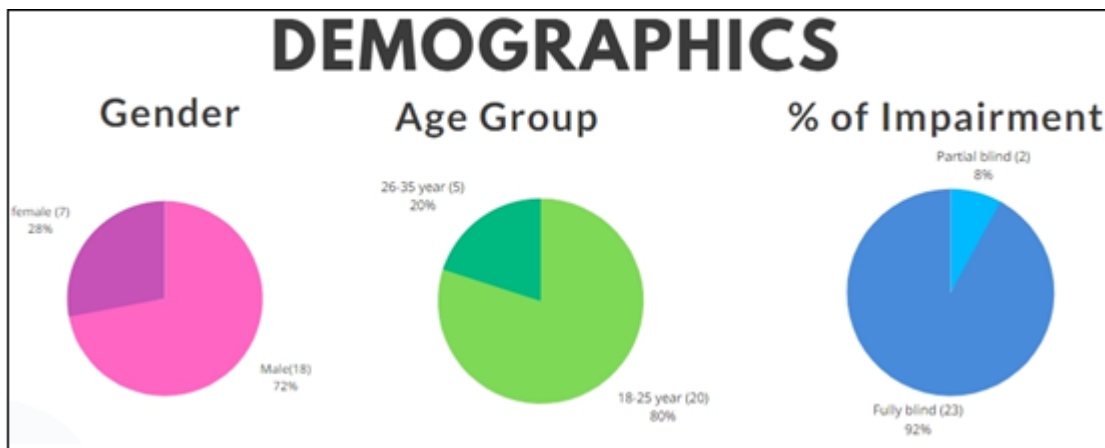
26 - 35 year - 5 Respondents

3) Percentage of impairment:

Partial blind - 2 respondents

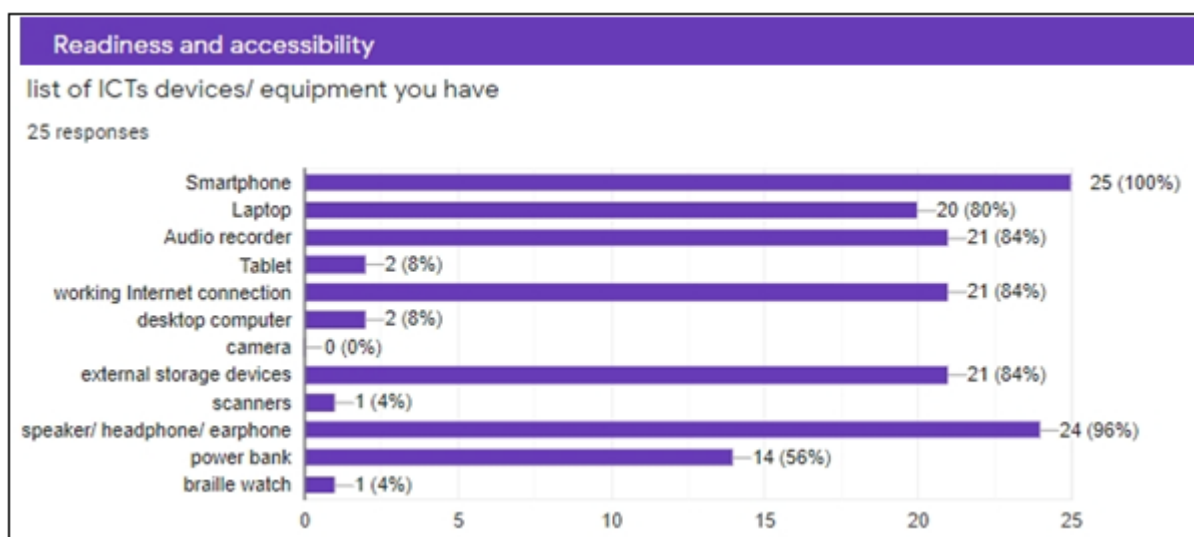
Fully blind - 23 respondents

4) City and State where respondents educational institute/ university/ college is located: Delhi



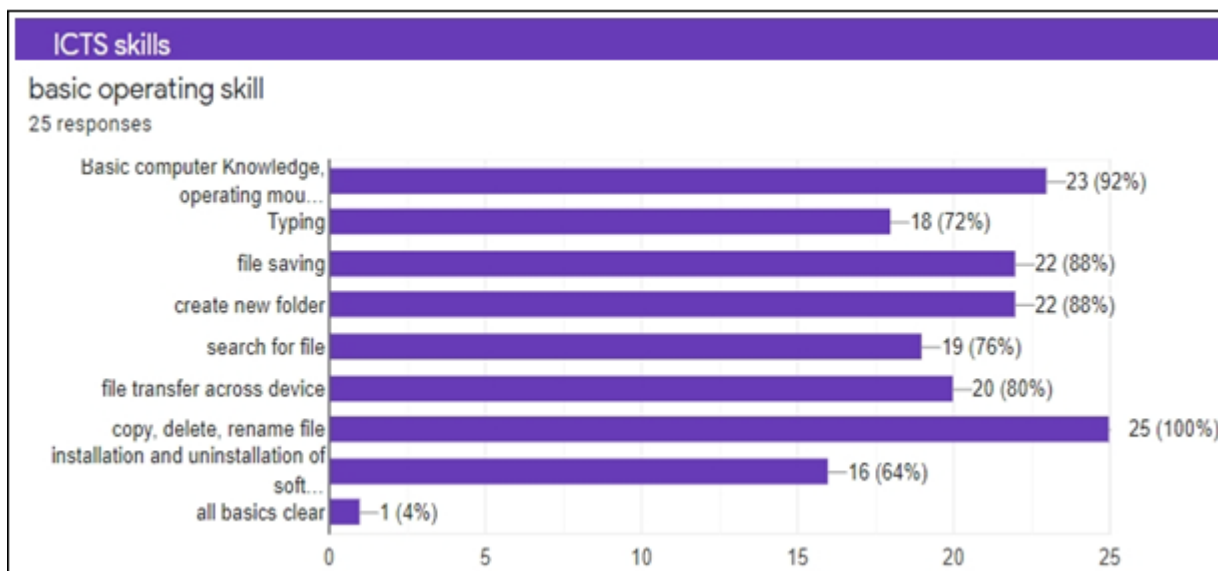
When asked about ICT devices/ equipments they have:
 All 25 said that they have smartphones, 20 of them have laptops, 21 have separate audio recorders, 14 of them have

powerbank, 4 of them said that their internet connection does not work properly. 21 of the respondents have an external storage device as pen drive, hard disk.



Computer related basic ICTs related skill:
 When asked about basic computer skills 23 out of 25 visually impaired students said that they know basic computer operation skills, like operating a mouse, can open files with the help of JAWS. 18 out of 25 said that know

typing, 16 said that they can install and uninstall different computer software. 20 said that they have the skill of transferring files across device, i. e. from laptop to mobile or from mobile to laptop.

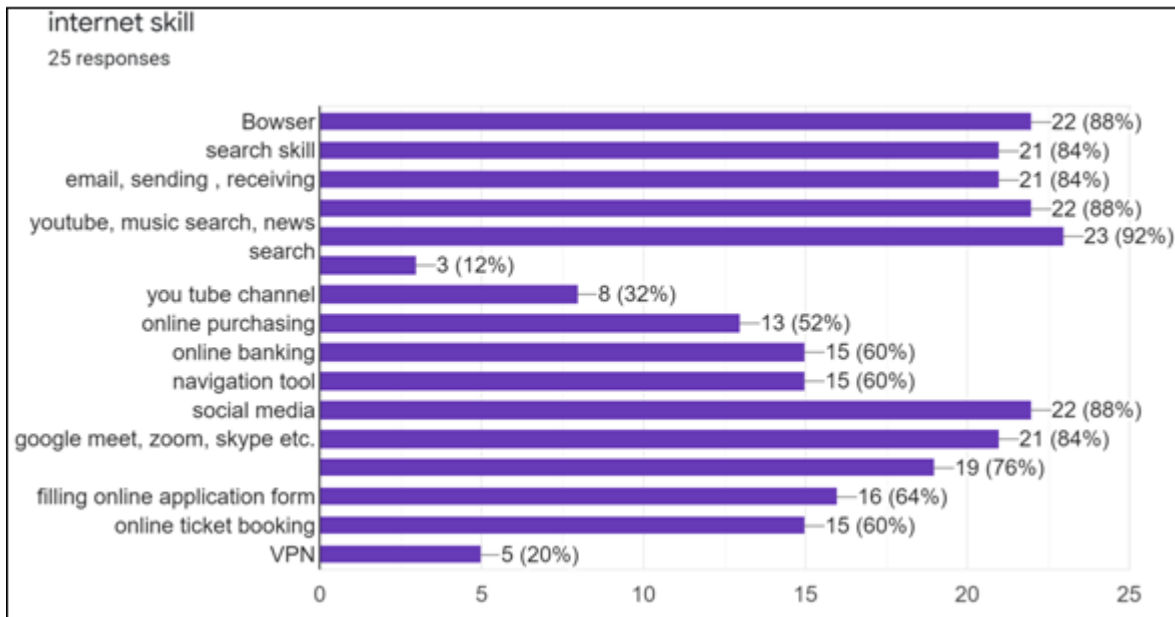


Challenges faced by visually impaired students in learning these basic ICTs skills, as they discussed in semi - structured interview -

- 1) JAWS is very costly. Crack version does not work very smoothly and creates a system slowdown problem.
- 2) Many softwares are not available in regional languages.
- 3) Braille keyboards are generally not available in training institutes, keyboards are costly.

Internet using pattern and browsing skills:

The ability of using a browser is in 88% of the respondents. 21 out of 25 said that they know the search skill with the use of keywords, 21 out of 25 said they know how to send and receive email. Only 3 said that they run a personal blog or website, 8 out of 25 said they upload their content on youtube. 22 said that they use social media. Only 5 said that they have ever used VPN (Virtual Private Network.)



Compilation of challenges faced by visually impaired students while using internet based interface, as they discussed in semi - structured interview -

- 1) Image - based CAPTCHAs are not suitable and almost impossible for users who are blind or have low - vision. So the filling of different online application forms and booking online a ticket is almost impossible.
- 2) Many Icons do not contain internal captions, so it is not possible for Talkback to read those tabs.
- 3) Updated versions of software initially don't take care of the accessibility dimension.

- 4) Talkback does not work with google meet. It is not very compatible with the updated version of google chrome too.
- 5) On social media platforms the facility of auto generated image caption is not there.
- 6) The description of material on online purchasing websites is not enough to understand product specification properly.

Content production skills:

Scale: 1= very poor skill or no skill, 2= poor skill, 3 = average skill, 4= above average, 5= excellent

Content production skill:	1 = Very Poor Skill	2 = Poor Skill	3 = Average Skill	4= above average	5= excellent	Mean	SD
Audio/Video Editing skill	12	2	6	5	0	2.16	2
PPT making and presentation	16	2	3	0	0	1.38	1.02
MS word format (writing and copy editing)	6	1	10	7	1	2.84	2.57
Image editing	18	2	4	1	0	1.52	1.26
Photo/ video capturing	5	4	12	3	0	2.54	2.19
SEO Process	24	0	1	0	0	1.08	0.48
Coding and Programming	20	3	1	1	0	1.32	0.97

Compilation of technology challenges faced by respondents while Producing Content:

- 1) Lack proper assistive software which could work smoothly with audio editing software. Audacity is pretty accessible but many features are not read by NVDA (NonVisual Desktop Access).
- 2) Video editing software lacks the features of real time audio description needed for editing.
- 3) Screen Reader like (NVDA / JAWS / VoiceOver / TalkBack) does not work effectively while making PPT

presentations or presentations. Accessibility softwares does not help in slide making.

- 4) Image editing software is not accessible enough because real time audio description facilities are not there, corel draw is not accessible.
- 5) Accessible softwares is very costly.
- 6) Image capturing software is still not compatible enough to direct for shot.

Online safety skill:	1 = Very Poor Skill	2 = Poor Skill	3 = Average Skill	4 = above average	5 = excellent	Mean	SD
Online virus protection, third party app issue	4	6	8	5	2	2.8	2.52
password protection	0	7	1	10	0	3.16	2.78
Permission and sharing	3	1	10	9	2	3.24	2.89

Compilation of technology challenges faced by respondents related to online safety:

- 1) License agreement conditions are very long; permission seeking conditions should be easy.
- 2) Issue of awareness.
- 3) Because of the cost factor of accessibility softwares maximum blind persons use the crack version of that software which increases the risk of malware attack and breach in privacy.

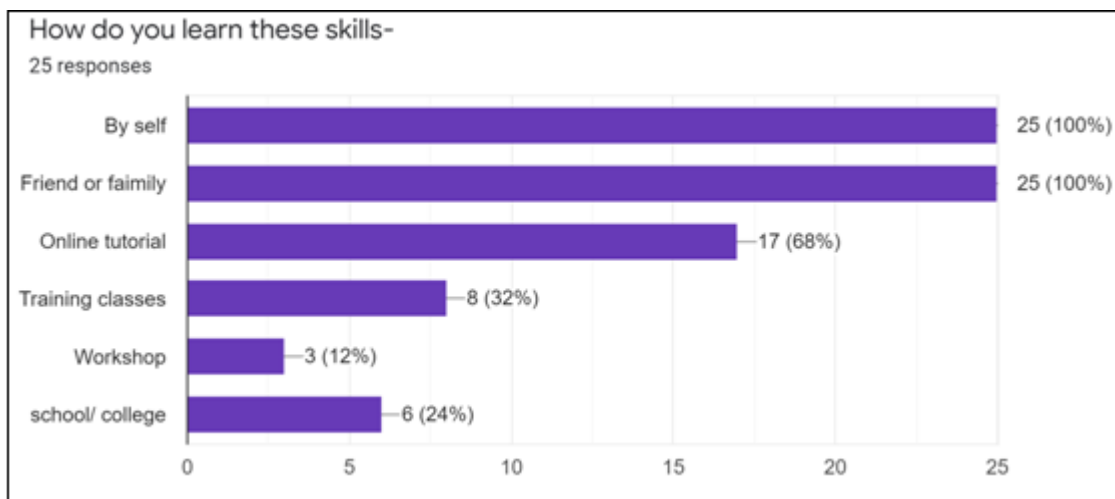
Compilation of assistive technology challenges faced by respondents:

- 1) Kibo app, which is called a one - stop accessible solution for any multilingual printed, handwritten and digital content, contains too much data.
- 2) As promised, a multilingual and handwritten accessibility solution, its performance is still not very effective.

- 3) Screen reader and other conversion software does not work on a real time basis so the content presented on screen during Google meet presentation (and other platforms) is not accessible at all.
- 4) Challenges of different screen readers - extremely robotic voice, accent issue, language issue.
- 5) Talkback does not read emoji/emoticons.
- 6) New updates of software (android based mainly) don't handle accessibility issues properly. So rather than providing solutions, the updated version creates problems.
- 7) Image to text converting software is not very effective for different fonts, and makes lots of mistakes. Especially in the case of Hindi.

How visually impaired students learn ICTs related skills

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8 out of 25 respondents said that they have taken special training classes to learn these skills. All respondents said that they learn these skills by practice or with the help of friends and family. 3 said that they have done workshops to learn and improve these skills. 6 said that they learnt these skills from their school and college too.

5. Compilation of Suggestions

- 1) Minimum accessibility criteria should be made for common used applications.
- 2) Different types of CAPTCHA methods should be introduced which can be used by blind people.
- 3) Software like JAWS (Job Access With Speech) should be made available for free.
- 4) Hardware like a braille keyboard should be subsidised.
- 5) Social media platforms should start auto generated image caption options.

- 6) Floating window technology should be developed which could read the content on an online screen sharing interface.
- 7) Accessibility related guidelines should be made.
- 8) Government should provide financial assistance for the R&D to accessibility software developing companies so that the cost of software could be minimised.
- 9) The proper guideline for license agreement language should be made.
- 10) To make visually challenged students competent enough in ICT related skills schools/ colleges should organise regular workshops and training programs.
- 11) It should be ensured that teachers know the issue of accessibility and appropriate technological solutions.
- 12) Game based skill developing software should be made.
- 13) Collaboration with international tech. firms and other governments should be done for technology transfer and R&D.

6. Conclusion

The study found that the majority of the respondents have basic ICT technical skills. But in terms of content production skill they are lacking.

Most of them said that accessibility is a big issue and softwares is not competent enough to address the required needs of visually challenged students.

On the basis of the study we can deduce that most of the ICT softwares have limitations and accessibility related hurdles. The accent and style of talkback softwares is not native. Most of the learners are learning these technological tools on their own, a lack of institutional support is there. it is the need of the hour to provide them with an effective institutional ICT - based learning support system.

Educational implication:

Schools, universities and colleges should integrate their curriculum with required assistive technology modules. Only the philosophy of inclusion is not enough, the training of different skill sets is the practical dimension of inclusive philosophy. Institutions should improve the access for ICTs facilities and support the training, learning activities for the visually - impaired students.

A 360 degree training program could be specially designed.

A special course of ICT could be made for college and school going visually impaired students.

A special training should also be provided to faculty members which empower them to effectively assist the visually impaired students.

Policy implication:

Policy should be made which should ensure state - of - the - art ICT - based facilities must reach to visually - impaired students. Policies should be made to ensure international based collaboration between the University and different stakeholders for sharing their resources like online audiobook library and accessibility related technologies. Collaborations should be done with silicon valley companies to provide necessary technology at very low cost to visually impaired people.

7. Future Research Directions

Research could be done on visually impaired persons who are working in different industries where their engagement with ICT tools is very high, like banking and other service sectors. Further research also could be done on specific segments related to visually impaired person engagement with the digital world.

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