

ACCESSIBLE TECHNOLOGIES FOR THE BLIND

Dr. Goutam Majee

Assistant Professor of History

Banwarilal Bhalotia College, Asansol, India

Abstract- Since very old times, humans have learned to use various technologies by employing their intelligence. Technology teaches people how to utilize their capabilities effectively, while also reducing and making labor more efficient. Accessible technology plays a crucial role in empowering visually impaired and disabled individuals. Especially in the third decade of the 21st century, nothing can be imagined without technology. This is because we currently live in the age of information and technology. This article primarily attempts to explore how visually impaired individuals can lead their lives and livelihoods with dignity using accessible technology. Braille script is of paramount importance for reading and writing for visually impaired individuals. Currently, various devices are available for reading and writing Braille. Moreover, visually impaired individuals can easily use computers by using screen reading software. They can easily use mobile phones or smart phones with the help of Google Text-to-Speech applications. These software and mobile applications are very effective for using social media such as WhatsApp, Facebook, Instagram, and email. Not only that, but talking sticks, accessible headbands, wristwatches, eyeglasses, and special types of shoes are currently being used for walking and moving around. There are ample opportunities to use talking thermometers, talking electric testers, image detectors, and optical character recognition software to make life easier. However, illiteracy and poverty have created a digital divide in the use of these electronic devices for countless visually impaired people in economically backward countries like India. I have gathered a number of articles and writings, studies, different websites which are relevant for this.

Keywords: Accessible technologies, blind and low vision, digital device, computer, Smartphone.

I. INTRODUCTION

Unlike other animals, early humans learned to use their hands, they have strived to find technologies to make their lives easier. For these early humans, branches of trees or pieces of stone were extremely important technologies. As science advanced and human civilization progressed, the use of technology increased exponentially. In today's age of information and technology, it is impossible to imagine life without technology. From the moment we wake up in the morning until we go to sleep at night, we use countless types of technology; there is no way to count them all. Thus, in the course of time, technology has made human life easier and more comfortable. It is no exaggeration to say that this technology has brought about a revolution in blind.

empowering the lives of visually impaired people, transforming their otherwise gloomy existence. These special types of technologies designed to assist the visually impaired or people with disabilities are called assistive technologies. Various tools and software fall under the ambit of assistive technology. Currently in the third decade of the 21st century, visually impaired individuals have access to Braille displays and computer software for reading and writing, as well as various devices, including talking sticks, for mobility. A variety of technologies are available for listening to and recording in audio format. With the help of various converter software, any image can easily be converted into an audio format and listened to. Here, we will primarily attempt to explore an accurate picture of the origin and development of various assistive technologies used for visually impaired individuals. Alongside this, we will also try to investigate how accessible these assistive technologies are to visually impaired people in India and how capable they are of using them.

Before the invention of Braille, blind people studied using various tactile letters and diagrams. That is, different patterns were embossed on wood, thick paper, or some other hard material. These raised letters or diagrams had to be understood by touching them with the hands. In addition, various strings or ropes were used for counting and performing simple addition and subtraction. They would tie one or more knots in the rope and solve mathematical problems by counting the knots. At that time, blind people did not have many opportunities for education. Their studies would stop at a very basic level.¹

In the second half of the 19th century, the invention of the Braille system in France, thanks to the efforts of Louis Braille, brought about a radical transformation in the world of education for the blind. However, in its initial stages, neither Louis

Braille's own educational institution nor the French time is displayed on this Braille display board.⁵ government recognized the Braille system. It was Consequently, there are difficulties in reading an only after Louis Braille's death that the system entire page at once. Of course, any text can be printed gradually gained acceptance.² Beyond the borders of out using a Braille embosser. In addition, modern France, the Braille system slowly spread to various libraries offer many facilities for the visually industrialized countries in Europe and the Americas. impaired to study through audio means. Various Through colonialism, the wave of the Braille system books recorded in human voices are available as also reached India and other underdeveloped colonial audio or talking books. Furthermore, with the help of countries.³ Across the globe, the Braille system screen reading software, a visually impaired person became the primary means of education for blind can easily use a computer or tablet. Accessing individuals.

Various devices for writing and reading Braille have much easier. Therefore, due to the rapid been invented in different parts of the world. The advancements in information and communication frame used for writing Braille is called a slate. A technology, accessing libraries has become much thick piece of paper or plastic is placed in this slate, easier for the visually impaired.⁶

and a stylus is used to create dots by puncturing the Again, nothing in today's world can be imagined paper or plastic. Later, the Brailler machine became without computers. In today's age of information and quite popular as a device for writing Braille. technology, computers are indispensable. For Subsequently, Braille books began to be printed computer education and training among the visually using Braille presses. In India, the first Braille press impaired, various types of screen readers are was established after independence, in the 1950s. currently used with the help of speech synthesizers Currently, various devices, including the Brailler, are and Braille displays. In fact, a screen reader is an used for writing Braille. By installing specific interface that maintains the connection between the software on a computer, Braille can be easily written user and the computer's operating system and its using the computer's keyboard. Moreover, various various applications. When a user gives a command devices are also available for reading Braille. With a to the computer using various keys on the keyboard, Braille display board, any text can be read in Braille the speech synthesizer transmits that command to the without printing it out. Braille code features are also computer's various applications and operating system found in smartphones. Therefore, various in its own language. On the other hand, this technologies are currently available for writing and synthesizer describes any character, word, sentence, reading Braille. However, due to their high cost, it is line, instruction, and even the exact position of the not possible for all visually impaired individuals to cursor on the computer screen through audio. It purchase and use all these devices.⁴

specifically highlights the focused item. Not only On the other hand, libraries are no longer considered that, this synthesizer even describes different colors mere storehouses of books and journals. Rather, they and points out spelling mistakes. This screen reader are now seen as powerhouses of knowledge. Modern software currently works seamlessly on Linux, libraries are equipped with various technologies. To Windows, Mac, and Android operating systems. make libraries more efficient and accessible for the Many of these synthesizers are available for free, visually impaired, they are being made more while others have to be purchased.⁷ In India, visually adaptable and accessible day by day with the help of impaired people primarily use screen reader software various information and communication or applications on computers and mobile phones. In technologies. With the help of a Braille display some cases, efforts are being made to bridge the board, a visually impaired person can easily read any digital divide for the visually impaired through text in Braille by touch. However, only one line at a training in digital disability awareness.⁸

In fact, in 1989, an American motorcycle racer NVDA software. Its use is particularly widespread in named Ted Henter invented a software called Job developing and underdeveloped countries. Currently, Access With Speech, or 'JAWS'. Ted Henter had this software is used in approximately 150 countries actually lost both his legs in a car accident in 1978. around the world. It is available in a total of 50 Since then, he had started thinking about developing languages. Initially, this software was only functional software suitable for the blind. In 1985, Henter, in a with Microsoft Word on the Windows operating joint venture with a company called Bill Joyce, system, but later it became compatible with other established the Henter-Joyce Corporation in St. software such as Microsoft Excel and Microsoft Petersburg, Florida, USA, at a cost of 180,000 US PowerPoint. As a software that assists visually dollars. In 2000, Henter-Joyce, Blazie Engineering, impaired people in their employment and and Arkenstone, Inc. merged to form a new company professional lives, it is unparalleled. Today, many called Freedom Scientific. Anyone can easily visually impaired individuals are successfully download and use this screen reading software from pursuing their careers with the help of this software.¹⁰ Freedom Scientific's official website. However, this As mentioned earlier, blind people face various software has two editions: the Home Edition for challenges when it comes to reading. They cannot personal use and the Professional Edition for easily read any book or follow a class properly by professional use. This software was very important looking at pictures or maps. When charts or diagrams for blind people to read or write anything on a are used in class, they cannot follow them at all. computer. It was a text-based application software. Currently, various devices are available for blind Initially, it only worked on MS-DOS. In 1995, a people to read. For those with low vision, there are revolutionary change occurred in this JAWS different types of magnifying devices. There are also software. This software started working as a screen several devices for reading large print in 18 to 24-reader software on the Windows operating system. point fonts. Reading for low-vision individuals is This software is capable of describing any text or facilitated by increasing color or contrast and graphics displayed on the computer screen in audio adjusting lighting. For those who are completely format. This software is extremely important for blind, the Braille system is extremely effective. blind people for writing or reading anything in Braille books are available, and Braille can also be Microsoft Word, reading in PDF, HTML, Notepad, read on mobile phones or computers using various etc. formats, surfing the internet, using social media, apps and software. With a Braille display board, any and more. This software is also effective on printed text can be converted into Braille and read by magnifying devices and other digital devices besides touch. A device called a Braille note-taker allows computers. Although this software is functional on users to take notes in Braille anywhere. In addition, the Microsoft Windows operating system, it is unable there are various devices for reading through audio. to work on iOS, Android, Mac, Linux, or other Books are recorded and stored in human voice. These operating systems.⁹ audiobooks are then listened to for reading. Hearing However, the full version of JAWS software cannot aids are used in this process. Previously, recording be used for free. And without the full version, it is not and reading were done using tape recorders. fully accessible. Considering this problem, in 2006, a Currently, various devices for reading through audio person named Michael Curran created a new software are available, such as MP3 players, iPads, mobile called NonVisual Desktop Access (NVDA). Since it phones, and Daisy players. Some software is now is completely non-commercial, it has become available that can convert any image or picture into increasingly popular among visually impaired people. an audio format, allowing it to be easily read by According to a 2023-24 statistic, the largest number listening. With an Optical Character Recognition of visually impaired people worldwide use this

(OCR) scanner, any printed text can be converted into an audio format and listened to.¹¹ Furthermore, this speech synthesizer is used for voice commands in various railway stations, airports, and other places.

Just as there are various devices for blind people to market areas, shops, shopping malls, and other read, there are also many types of devices available places. The use of voice typing on Google, for them to write. For people with low vision, there are special types of paper and pencils that allow for platforms is now widespread among everyone. writing in bold letters and with altered color Speech synthesizer technology is also crucial in this combinations to suit their needs. For those who are area.¹⁵

completely blind, a slate and stylus are used for writing in Braille. Any person with low vision can easily write using an adaptive keyboard. With speech and overall life. Since visually impaired individuals recognition software, any blind person can easily dictate text using voice commands. Text-to-speech that utilize their hearing and touch senses to assist software easily converts any text or image appearing on a mobile screen into an audio format, making it suitable for reading.¹² Besides education, technology is extremely important for visually impaired people in their daily movements

In today's life, it's impossible to imagine life without various indications through sounds and vibrations. a mobile phone or cell phone. From the moment we wake up until we go to sleep, we rely on these handheld devices for a significant portion of our day. developed in Germany, where various indicators are To make them accessible for the blind, Android and iPhone apps have available called TTS or Text-to- Speech. The TalkBack feature used on Android phones was originally a project of Google's Eyes- Free project. It was first adopted in 2009. Nolan Darilek's name deserves special mention in this context. Although TalkBack saw some improvements

in 2011, it still had several limitations for blind and low-vision users. Subsequently, significant progress was made in the Ice Cream Sandwich version of TalkBack. The Jelly Bean version became quite popular. The addition of Braille display features to

Currently, more than one billion people worldwide use social media platforms in their daily lives. To express their likes, dislikes, and feelings, they easily share their thoughts through various text messages, as well as pictures, videos, and images. Blind people are also not lagging behind in using social media. Special smartphones. Furthermore, the inclusion of a magnifying facility option has been very helpful for individuals to use Facebook, Twitter, WhatsApp, and other social media platforms. The Honeycomb version of TalkBack is also widely used.¹³ With the help of a speech synthesizer, any text any image to a blind social media user. Furthermore, can be easily converted into audio format and descriptions of ongoing events are provided through listened to instantly. Its use is not limited to the captions in videos. Voice typing has become visually impaired; many sighted individuals are also extremely accessible for visually impaired using it nowadays. In today's busy life, its use is individuals when writing messages. Although, the bound to increase even further in the future.¹⁴ use of voice typing is also being observed to a

significant extent among sighted people today.¹⁷ accessible technology as their counterparts in Using AI and shortcuts, social media platforms like America or other developed countries. In most cases, Facebook and Instagram have made it very easy to due to lack of financial resources, they are unable to access any image, video, or GIF in audio format. use accessible devices even when needed. It is Even countries like the United States have important to remember that in a country like India, implemented various laws to make social media poverty and malnutrition are among the major causes platforms accessible to the blind. Currently, a large of disability. Moreover, illiteracy often becomes a number of blind people use social media platforms. significant obstacle in using these accessible Anthony Ferraro, a Paralympian, regularly posts technologies. pictures of various events in his life on social media platforms. He currently has 214,000 followers. Lucy Edwards, another content creator, regularly posts about issues related to the blind. She currently has 136,000 followers. However, while social media platforms like Snapchat and TikTok are popular among Gen Z or the younger generation, these platforms are still not accessible to the blind. Various shortcomings are observed in their usability for visually impaired users.¹⁸

II. CONCLUSION

There is no doubt that accessible technology has brought about unprecedented changes in the lives of blind people. The widespread use of technology is now being observed in the use of the Braille system, the primary medium of education for the blind. Various modern devices for writing and reading Braille have further increased the accessibility of Braille. Moreover, software and apps have been developed to convert any text or image into audio format. With the help of smartphones, tablets, computers, or other devices, blind people can easily access web content by converting any text or image into audio format. Screen reading software or TalkBack apps are extremely helpful in using social media platforms or any website. Even e-commerce websites and apps are regularly used by blind people for shopping today. Furthermore, devices such as talking sticks, magnifying glasses, talking calculators, talking thermometers, and talking testers have brought about amazing changes in empowering the blind. However, Indian blind people do not enjoy the same freedom and convenience in using

REFERENCES

- [1] Biswas, A., (6th February, 2025) *The Evolution of Braille: legacy and relevance*, Special Lecture, 48th Kolkata Book Fair-Press Corner, ShrutiKalpa, Retrieved from, https://youtu.be/KmiQTRUgTEA?si=2d9_4In8G7Q-DETz
- [2] Jeffrey, L. S., (2004) *All About Braille*, Enslow Publishers, New Jersey, USA, pp. 1-8; *What makes Braille Works different*, The Braille Works, Retrieved from, <https://brailleworks.com>
- [3] Advani, L., (1991) *An Overview of Braille Development in India*, National Institute of Visually Handicapped, Dehradun, Ministry of Welfare, Govt. of India, Retrieved from, <https://cdnbbsr.s3waas.gov.in> Uploaded on 28th Nov. 2024, p. 19.
- [4] *The Evolution of Braille: Can the Past Help Plan the Future?*, A three-part article Part 1, Braille Authority of North America, (2012) Retrieved from, <https://www.brailleauthority.org>
- [5] Ibid.
- [6] Rubina Anis, (March 1st, 2015) *Information Technologies for Visually Impaired People in Library*, Department of Library & Information Science, Shri Venkateshwara University ,Gajraula,Amroha (U.P), pp. 561-63. Retrieved from, <http://ijarse.com> Access and Engagement, The American Foundation for the Blind, Retrieved from, <https://afb.org>
- [7] *An introduction to screen readers*, AbilityNet, Retrieved from, <https://abilitynet.org.uk>
- [8] *JAWS Screen Reader: Empowering Accessibility* , Blazie, Retrieved from, <https://www.blazie.co.uk>
- [9] *Changing Lives: The story behind the free NVDA Screen*, Retrieved from, <https://www.nvaccess.org>
- [10] Lisa R. Tebo, (December 6th, 2016) *Assistive Technology for Students with Visual Impairment*, capstone project, Bowling Green State University, Retrieved from, <https://www.qiat.org>
- [11] Ibid.

- [12] *Google TalkBack Voice Assistant Mode and Settings*, android.com, Retrieved from, <https://www.android.com>
- [13] Bendale, P. and others , (2022) *Text Extraction from Image, Word, PDF and Text-to-Speech Conversion*, International Research Journal of Engineering and Technology, Volume: 09 Issue: 04 Apr 2022, e-ISSN: 2395-0056, Retrieved from, www.irjet.net
- [14] *Text-to-speech (TTS) synthesis* ResearchGate, (1st September, 2017) Retrieved from, <https://www.researchgate.net>
- [15] Velázquez, R. (2010) *Wearable Assistive Devices for the Blind*, Mukhopadhyay (Eds.), *Wearable and Autonomous Biomedical Devices and Systems for Smart Environment: Issues and Characterization*, LNEE 75, Springer, pp 331-349, Retrieved from, <https://arxiv.org>
- [16] *Using Social Media with a Visual Impairment or Blindness: Facebook, Twitter, and LinkedIn*, American Foundation for the Blind, Retrieved from, <https://afb.org>
- [17] *Social Media for the Visually Impaired*, Braille Works, March 3, 2022, Retrieved from, <https://brailleworks.com>