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# **Assistive Technologies in Mumbai's Resource Centres: A Comprehensive Survey**

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## **Abstract:**

This study focuses on assistive technologies and services for visually impaired students, aiming to improve their access to information and support their education and career development. The research highlights the importance of assistive technology in bridging the digital divide and empowering visually impaired individuals. The study uses a survey methodology, utilizing a self-administered questionnaire to collect data from resource centres for the visually challenged in Mumbai & the visually challenged users of the centres. The findings highlight the constant improvement in assistive technologies, driven by better technology and changing user needs. The researchers emphasize the need for simple, user-friendly interfaces and compatibility with various devices to ensure easy access to features and functionalities. Feedback from users revealed the need for improved accuracy and reliability of the technology. Customization options and affordability were identified as crucial factors, enabling users to personalize settings and make assistive technologies more accessible. The findings of this research can significantly benefit visually impaired students by providing comprehensive information on available assistive technologies, serving as a valuable resource for them, and inspiring further research and development in the field. The study emphasizes the need to recognize the

significance of assistive technologies in enhancing the quality of life for visually impaired individuals, promoting inclusivity and accessibility in society.

**Keywords:** Assistive Devices; Assistive Services; Assistive Technology; Visual Impairment; Visually Impaired Person.

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### **Introduction:**

Living with visual impairment presents unique challenges, as individuals face limitations in accessing information, navigating their surroundings, and engaging in daily activities. However, thanks to rapid advancements in technology, a world of possibilities has opened up for the visually impaired community. Assistive technology has emerged as a powerful tool, enabling individuals with visual impairments to enhance their independence, improve their quality of life, and participate more fully in society. “The Persons with Disabilities (Equal Opportunities, Protection of Rights and Full Participation) Act, 1995, Act No. 1 of 1996” and “Rights of Persons with Disabilities Act, 2016, Act No. 49 of 2016, Section 3(1) (a)” (Department of Empowerment of Persons with Disabilities (Divyangjan), Ministry of Social Justice & Empowerment, Government of India) are some legal frameworks to ensure equal opportunities and rights protection for disabled individuals in India.

Despite the existence of such legal framework & assistive technologies and services, many students with disabilities, including visual impairments, remain unaware of the resources available to them. This study aims to explore the remarkable innovations in assistive technology that are transforming the lives of visually impaired individuals. The study also analyses the services & technologies that are provided by the resource centers in Mumbai. It is essential to create awareness and provide comprehensive support to students with disabilities from the beginning of their educational journey.

## **Assistive Technologies for the Visually Challenged:**

Assistive technology (AT) plays a crucial role in empowering visually impaired individuals. AT encompasses a wide range of tools, software programs, equipment, and products designed to enhance learning, work, and daily capabilities for people with disabilities. For visually impaired individuals, AT offers flexibility and accessibility, providing them with equal opportunities to access information, education, and employment. Over the years, assistive technologies for the visually impaired have undergone significant developments. From ancient tools like guiding sticks to the modern innovations of Braille, audiometers, reading machines, and screen readers, these technologies have transformed the lives of visually impaired individuals. The arrival of smartphones and tablets has further expanded the possibilities through mobile apps, offering features such as screen readers, magnifiers, and navigation aids. In this study, assistive technologies for the visually challenged are classified into three major categories they are as follows:

### **Assistive Technologies for Daily Living**

Assistive technologies for daily living encompass a range of devices, tools, products, and applications specifically designed to assist visually impaired individuals in performing their daily tasks and activities with greater ease and independence. White Cane, Braille Watches, etc are some examples of this category.

### **Assistive Technologies for Computer Access**

Computer access is an important aspect for visually impaired individuals, as it helps them to communicate with the stored data on a computer. However, this communication process can be challenging without the aid of assistive technologies. NVDA, JAWS talking software, etc are some examples of this category.

## **Assistive Technologies for reading printed materials/ Magnifiers**

Access to reading printed materials is another essential focus area, aiming to provide visually impaired individuals with the ability to read or gain access to written or printed content through the use of assistive technologies. Magnifiers are the most valuable assistive devices in this category. Magnifiers are highlighted as devices that utilize magnifying lenses to enlarge text and graphics on computer screens or in printed materials. These devices effectively increase the size and contrast of text and graphics, making them more accessible to visually impaired individuals.

By exploring the diverse range of assistive technologies for the visually impaired that exist in the market, we can gain insight into the advancements and innovations in this field. This exploration will allow us to understand the availability and accessibility of these technologies to visually impaired individuals. To achieve the objective of this study, it is important to identify the different assistive technologies and services available for visually impaired individuals in various resource centers & their impact on its users.

## **Review of Related Literature**

Literature is any source that provides information about some aspects of the proposed research & the critical analysis of existing literature in a specific field or topic is known as the review of related literature.

The importance of assistive technologies in improving the mobility & independence of visually impaired individuals but the current navigation system lacks some critical features that are necessary for independent navigation. Some of the missing features include real-time obstacle detection, accurate indoor mapping, etc. This comprehensive review of navigation tools for the visually impaired highlights existing limitations and proposes recommendations for improving future systems, ultimately aiming to enhance independence and

mobility for visually impaired individuals. (Kuriakose, Bineeth...(et al), 2022). Limited awareness of visual disability and AT, and the psychological sensitivity of disabled users in Saudi culture state the importance of promoting awareness and understanding of visual disability and AT in Saudi Arabia to improve access to technology for disabled students. This study puts light on the unique factors influencing assistive technology adoption among visually impaired students in Saudi universities, & giving importance to the need for increased awareness. The recommendations provided aim to enhance access and support for disabled students in utilizing technology effectively. (Shehri, Waleed AI...(et al), 2022). A promising solution to the challenges faced by visually impaired or disabled individuals in navigating their surroundings. The low-cost assistive device kit has the potential to make a significant impact on the lives of many people who may not have access to more expensive alternatives. This work introduces a low-cost assistive device kit that addresses the navigation needs of visually impaired or disabled individuals, pointing to affordability, functionality, and user experience. The project holds great importance to those who lack access to expensive alternatives. (Beingolea, Jorge Rodolfo... (et al), 2021). The use of assistive technology (AT) for students who are blind/visually impaired and the strategies being used by Teachers of the Visually Impaired in North Dakota to increase the use of AT by classroom teachers & identified strategies for supporting the implementation of AT in general education classrooms, such as providing professional development for classroom teachers, creating a team approach to AT implementation, and advocating for funding and resources for AT. This thesis emphasizes the barriers and strategies surrounding the implementation of assistive technology for visually impaired students in general education classrooms, stressing the need for increased awareness, resources, and support. (Hamlin, M, 2021). Assistive devices have the potential in the future, & the identified opportunities can provide practical ideas for research & development in the field of assistive devices for the blind & visually

impaired. This article highlights the potential of assistive devices in overcoming barriers faced by individuals with presbyopia, offering opportunities for future technological advancements. (Hwang, Jumi... (et al), 2020).

The review has highlighted the challenges and barriers the visually impaired face in accessing assistive technology tools. In addition, research has been made on different navigation tools available for people with visual impairment.

The present research is conducted to survey the resource centres for the visually impaired and identify services and technologies provided by these centres. The research also attempts to analyse the impact of Assistive technologies & services on visually impaired people.

### **Objectives of the Study:**

- To identify different Assistive Technologies & Services available for people with visual impairment in different resource centres.
- To find out the impact of Assistive technologies & services on visually impaired people.

### **Methodology & Scope of the Study:**

The study adopted a survey method to gather data from five resource centres and eleven visually challenged users. The research design includes the development of questionnaires for the resource centres and the users to collect information on various aspects such as centre details, user demographics, and opinions on assistive technologies. The data collection tool chosen for this study is the questionnaire, administered through personal visits and telephonic interactions. The study's population comprises the visually challenged population and the selected resource centres in Mumbai, while the sample includes the five chosen resource centres and their users based on random sampling methods. The research findings aim to provide insights into the current state of assistive technologies and services, their effectiveness, and areas

of improvement in resource centres for visually impaired individuals in Mumbai. The study's scope is limited to visually impaired individuals and their experiences within the selected resource centres in Mumbai.

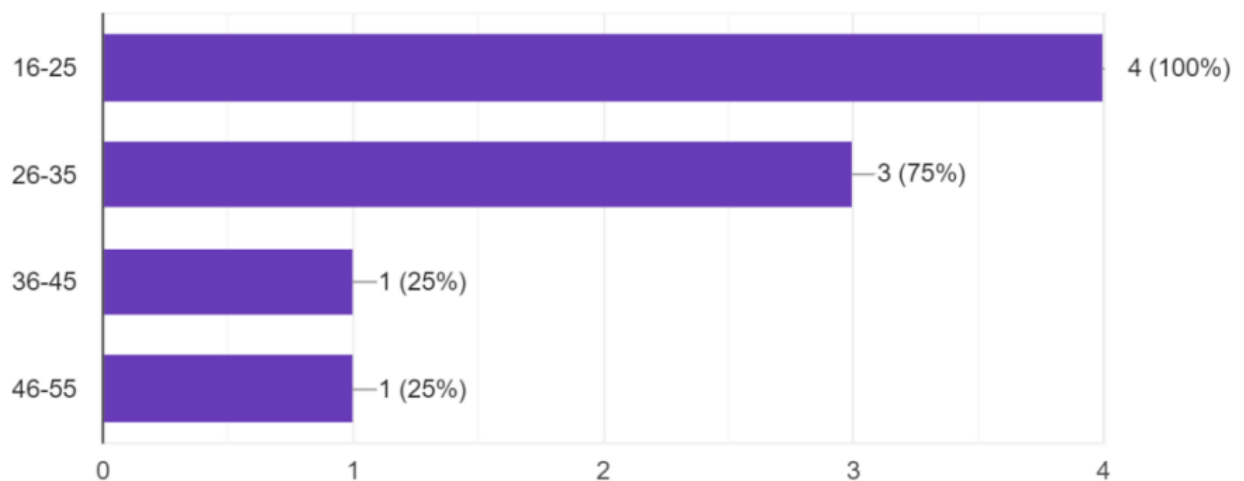
### **Data Analysis & Interpretations:**

The questionnaire was distributed to five resource centres in Mumbai, resulting in a positive response from four centres, who filled out the questionnaire.

Following are the details of the centres that filled out the questionnaire

1. M. K. Tata Memorial Learning Centre for the visually challenged
2. National Association for blind
3. Smt. Samjuben Girdharlal Vora Educational Library for the Visually Challenged
4. St. Andrew's Vision Centre

#### **1. Age group of the users in the centres**



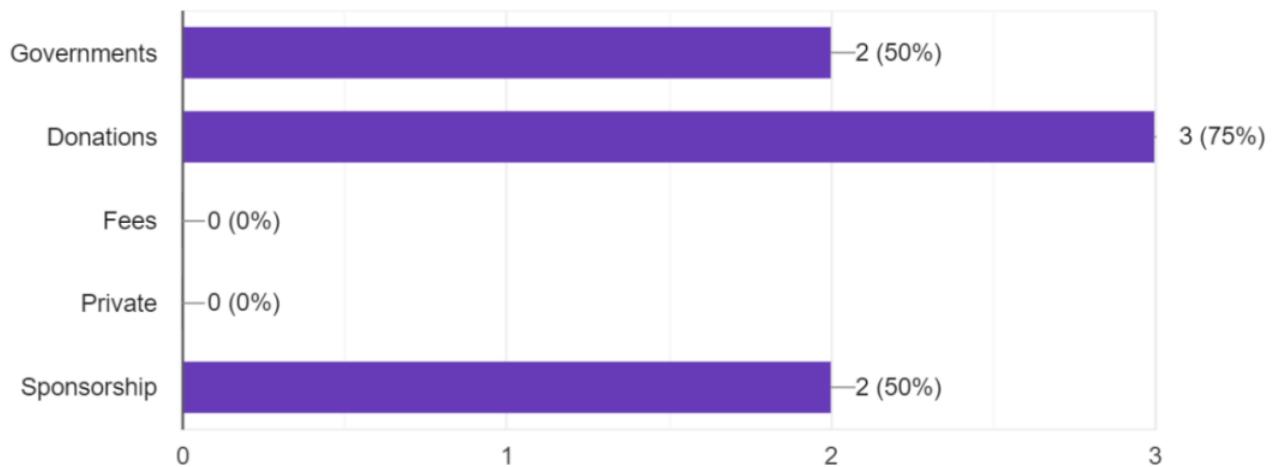
**Figure1: Responses on the age group by the Centre**

Based on the above table, it can be seen that the majority of individuals accessing assistive technology provided by the centre fall in the age group of 16-25, followed by the age group of 26- 35. These age groups are crucial as



individuals within this range are primarily in their career-building and learning stages. Assistive technologies can empower them to pursue their education, whether it be for undergraduate or graduate degrees.

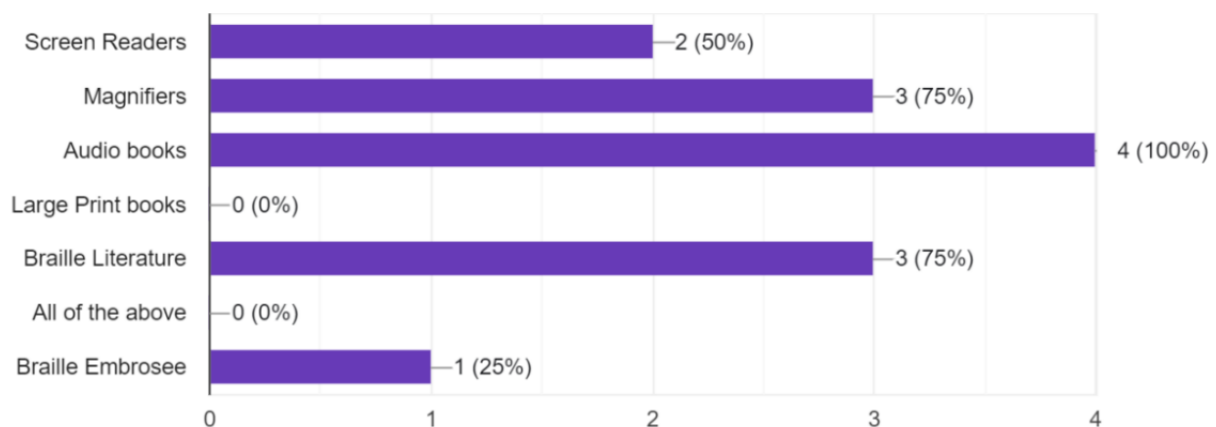
## 2. Funds for Assistive technologies in centres



**Figure 2: Funds for the Assistive Technologies**

Based on the information presented in the figure, most resource centres for the visually challenged in Mumbai are funded through donations. Resource Centres for the visually challenged in Mumbai rely heavily on the support of donors to sustain their operations. While sponsorships and government funding are also important sources of funding.

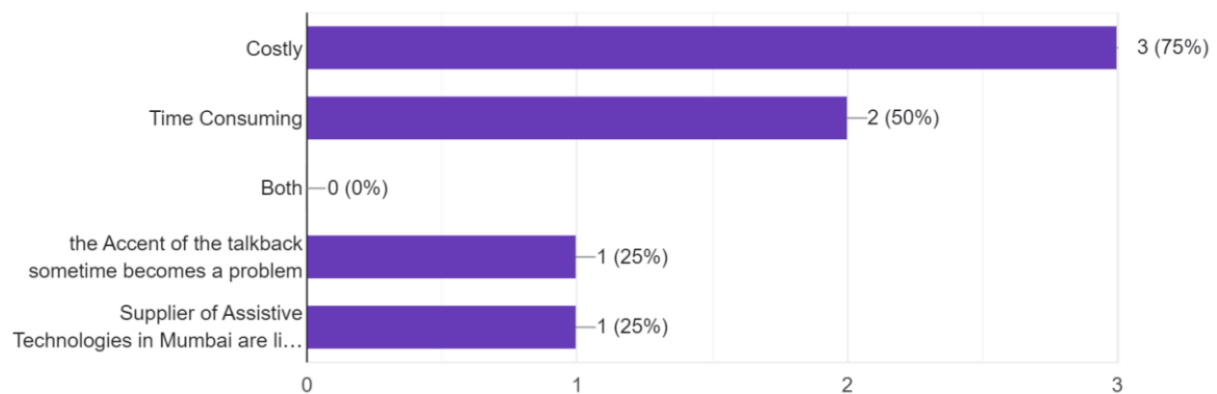
## 3. Assistive technologies in the Centres



**Figure 3: Assistive technology for education in centres**

Based on the figure mentioned, it appears that audiobooks, magnifiers, screen readers, and braille literature are the most commonly used types of assistive technology by centres for the education of the visually impaired. These services primarily depend on the type of user, as visually impaired individuals can be categorized into two major groups: blind and those with low vision. Both blind and low-vision students typically utilize audiobooks, screen readers, and magnifiers to aid in their education. However, braille literature is typically only used by blind students, as it provides a tactile reading experience through raised dots on a page.

#### 4. Drawback of Assistive technologies



**Figure 4: Drawbacks of assistive technology**

The figure suggests that assistive technology poses significant challenges for the resource centres that support individuals with disabilities. One of the major drawbacks is the high cost of such technology, which can strain the budgets of centres that rely on donations and grants. Additionally, the installation and setup of assistive technology can be time-consuming and may require the assistance of able-bodied individuals, further burdening resource centres. Furthermore, resource centres in Mumbai have reported limited suppliers of assistive technology, making it challenging to purchase products from various sources. Finally, users of assistive technology have noted that the quality of screen readers' voices can be problematic, with unclear and difficult-to-understand

accents. These issues highlight the need for further investment in and development of assistive technology that is affordable, user-friendly, and accessible to all individuals with disabilities.

#### **5. Number of Assistive devices & products in the different centres**

<b>Type of assistive devices</b>	<b>No. of centres offering the device/product</b>
Screen reader	3
Magnifiers	3
Audio Books	1
Braille Printer and Embrosee	2

**Table 1: Number of assistive devices & products in the centre**

Table 5 represents the type of assistive technologies offered by different centres. As evident from the table, the majority of centres i.e. 3 are offering access to screen readers and magnifiers. It was observed that the most commonly used screen reader software was JAWS and NVDA.

It was found that only one resource centre was offering access to audiobooks. It had an impressive collection of 5,748 audiobooks. While the other three centres do not maintain their audiobook collections, one centre has access to a comprehensive database through their subscription to Suganya Pustakalay, ensuring access to a wide range of audiobooks for their users.

Regarding Braille printers and Embrosee, two centres already provide these valuable resources, supporting individuals in creating Braille materials.

Encouragingly, the third centre has plans to introduce these services, indicating a commitment to expanding its accessibility offerings.

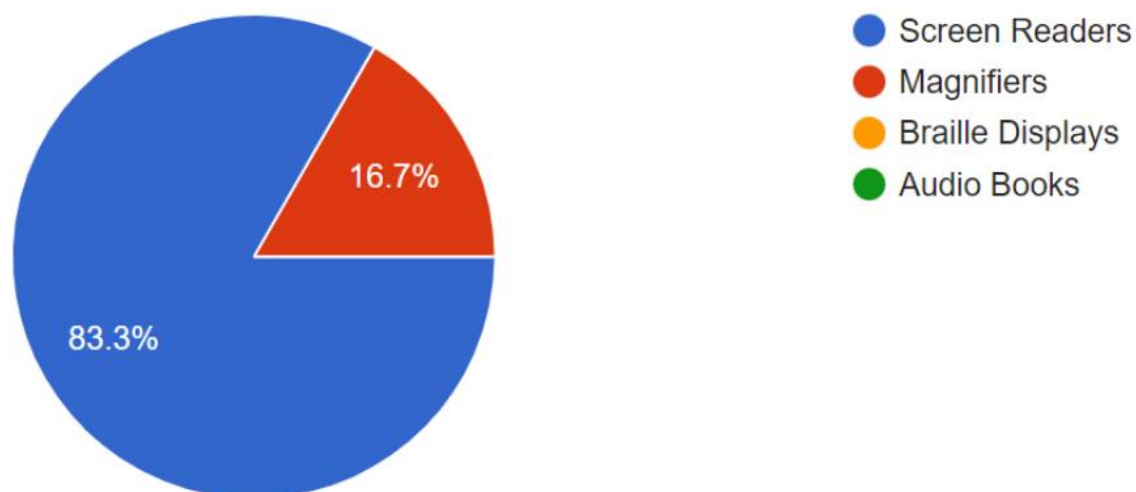
## 6. Number of responses from the users of the resource centres

Responded to the Questionnaire	M.K. Tata Memorial Learning Centre for the Visually Challenged	National Association for Blind	Smt. Samjuben Girdharlal Vora Educational Library for the Visually Challenged	St. Andrew's Vision Centre	Xavier's Resource Centre for the Visually Challenged
No of Users	2	0	2	2	6

**Table 2: Users responses to the Questionnaire**

The above table shows the number of responses the researcher got for the questionnaire from the users of the Resource Centres.

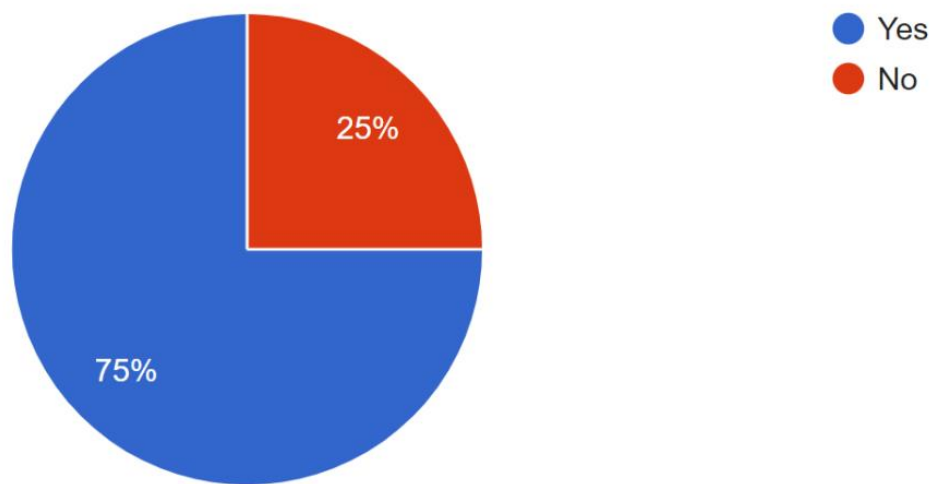
## 7. Mostly used Assistive technology by the users



**Figure 5: Mostly used assistive technology by the users**

Based on the given chart, it is evident that screen readers are the most commonly used assistive technology by visually impaired users, followed by magnifiers. These two technologies have significantly impacted the lives of visually impaired individuals and play a crucial role in their education. Screen readers allow visually impaired users to access digital content by converting text into synthesized speech or braille output. This technology enables them to read books, articles, emails, and websites, among other digital content. Screen readers also provide navigation and orientation assistance by announcing the location of the cursor and other on-screen elements, enabling visually impaired individuals to navigate complex digital environments. Magnifiers, on the other hand, enlarge text and graphics, making them easier to read for individuals with low vision. They can be used for reading printed material, such as books and newspapers, as well as for viewing digital content on screens.

#### **8. Training/ help needed for using Assistive technology**

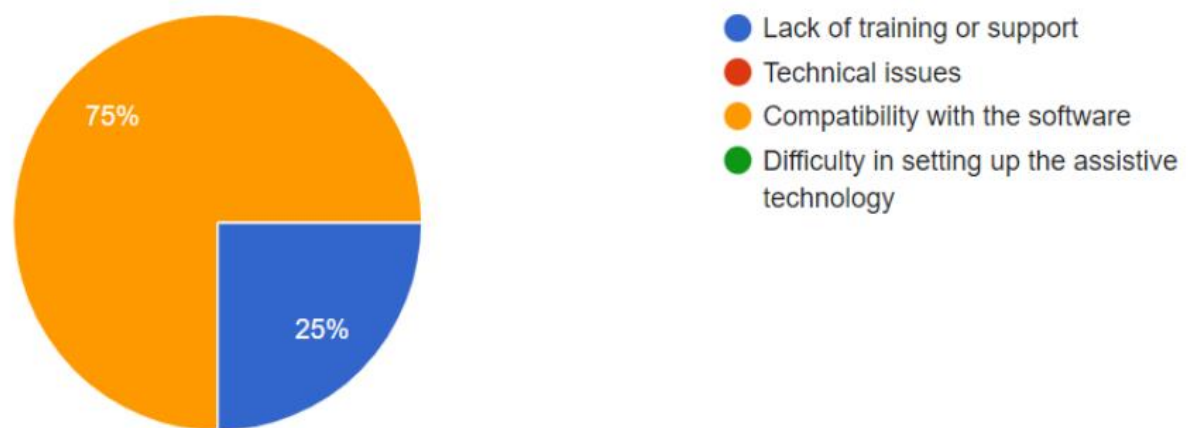


**Figure 6: Help/training needed by the users**

Based on the diagram, it appears that a significant majority (75%) of the users indicated that they require training or support to become proficient in using assistive technologies. This is especially important for individuals with visual impairments, who may require additional assistance to become familiar with the technology. To address this need, it may be helpful to provide training or

support programs that cater to the specific needs of visually impaired individuals. These programs could include hands-on training sessions, user manuals in accessible formats, and online resources that provide step-by-step instructions for using assistive technologies. Additionally, it may be helpful to have dedicated support staff who can assist users with any questions or issues they may encounter while using the technology. By providing comprehensive training and support, individuals with visual impairments can feel more confident and comfortable using assistive technologies, which can ultimately improve their quality of life and help them to better navigate the world around them.

## 9. Challenges & Barriers to using Assistive technology



**Figure 7: Barriers & challenges faced by users**

The diagram suggests that the biggest challenge and barrier to using assistive technology is software compatibility, as indicated by 75% of users. This highlights the importance of ensuring that assistive technologies are designed to work seamlessly with existing software and that they are regularly updated to keep up with changes in technology. Another major barrier, as previously discussed, is the lack of training and support, which can make it difficult for users to become proficient in using assistive technologies. To address this challenge, it may be helpful to provide dedicated training and support programs,

as well as online resources and user manuals that are designed to be accessible and easy to understand. In addition to software compatibility and training and support, the researcher suggests that there are also some drawbacks with specific screen reader software. Issues such as voice recognition, image reading, and playback features can make it challenging for users to fully access and utilize the technology, as all issues were brought to notice by researchers through the users of this software.

### **Major Findings:**

- Assistive technologies for visually impaired people are constantly improving to keep up with technology advancements and user needs.
- The interface of assistive technologies should be easy to use, user-friendly, and understandable & they should work well on various devices like smartphones, tablets, and computers.
- Users want improved accuracy and reliability in these technologies to accurately identify objects, text, and visual elements.
- Customization options like adjustable font size, colour, and audio playback speed are important to meet individual user preferences.
- Affordability is a challenge, and developers should explore ways to make these technologies more affordable or offer funding options.
- White Canes, screen readers, and magnifiers are assistive technologies that have greatly improved the lives of visually impaired individuals & they enable access to digital content, education, and employment opportunities, promoting independence and a better quality of life.
- Additional enhancements for screen readers should include image recognition, natural-sounding voices, and playback features to enhance the user experience.

## **Conclusion:**

Assistive technologies have emerged as powerful tools that are transforming the lives of visually impaired individuals. These technologies provide equal opportunities to them for their daily living to computer access tools & reading. The study highlighted the presence and impact of these technologies in resource centres in Mumbai, putting light on the availability, usage, and challenges visually impaired individuals face. Visually impaired individuals can derive a great benefit from the resource centres that are specially working for them. The findings of the study emphasized the importance of comprehensive support and awareness from the beginning of the educational journey for students with disabilities. Training and assistance in using assistive technologies were identified as crucial needs, highlighting the importance of providing accessible training programs and user-friendly resources. Software compatibility and the quality of screen reader voices were identified as major challenges, calling for continuous development and improvement in these areas. Affordability was another concern, indicating the need for exploring funding options and making assistive technologies more accessible to all. Further research in this area might be done by investigating the integration of emerging technologies, such as artificial intelligence (AI) and virtual reality (VR), in assistive technologies for visually impaired individuals. This could include exploring AI-powered image recognition systems or VR-based navigation aids to enhance accessibility and independence.

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