

Assistive technologies for the visually impaired: prospects and challenges in a developing country like India

Dr Aruni Sharma

Associate Prof. Jai Narain PG college, Lucknow

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ABSTRACT

In broad terms an assistive technology is one which enables an individual with an impairment, physical or intellectual, to perform and accomplish something which he or she would not be able to achieve without the use of such technology or device. Assistive technology is any device, software, or equipment that helps people work around their challenges. These technologies may include both low-cost tools and high-tech equipment. They are available on a variety of platforms these days due to the advancements in science and technology. Things like the text-to-speech have become commonplace and are available on desktops, mobile phones and tablets.

Such technologies have come to occupy a very important place in the lives of people with visual impairment. They are helping in creating and enabling environment where basic tasks can be accomplished independently with minimal help from humans. These include screen readers available on almost all technology platforms, special mobility devices like smart canes, electronic braille devices like the Orbit Reader20, BrailleMe, IIT Delhi's Dotbook and many more.

Although the accessible computer technologies came to India during the mid-1990s, it is during last 15 years or so that these technologies have been widely used in India. So, the screen readers have become somewhat commonplace and are being used on desktops, laptops, tablets and mobile phones in fact the mobile devices are gradually replacing laptops for most of the tasks.

In today's time the mobile phone has become a minicomputer acting as many devices combined into one. Interesting technologies are evolving based on mobile phone use. It is here that most of the advanced assistive technology environments are evolving.

This paper would try to examine the development of assistive technologies in the light of the above facts. It will also consider the challenges in availing fruits of technological developments by the relatively poorer population of the disabled community in developing countries like India.

Introduction

It is an important goal of the modern societies to provide equal access to public services to all, including the differently abled. This objective has been enshrined in various laws enacted by different countries, USA being the first one of them and India also one of the early adopters of such legislations.

'Access' can be defined as having a reach to something. In computer terms, it means Reading, storing and retrieving information. Accessibility can be defined as *approachability, usability or practicability.*

Accessibility Technology is one which provides special means to persons with special needs to have access to something which they cannot use in an ordinary manner like most of the other people are able to accomplish.

In broad terms an assistive technology is one which enables an individual with an impairment, physical or intellectual, to perform and accomplish something which he or she would not be able to achieve without the use of such technology or device. Assistive technology is any device, software, or equipment that helps people work around their challenges. These technologies may include both low-cost tools and high-tech equipment. They are available on a variety

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Some recent developments in the field of assistive technologies

1. Low-cost braille displays

Although the braille displays have been in use in the western countries for years, their prohibitively high cost has been the main hindrance in their adoption in developing countries like India. However, successful attempts have been made recently to provide low-cost alternatives. Thus, now we have braille displays like the Orbit Reader20, Brailleme and Dotbook. these braille displays cost only a fraction of the expensive devices in use in western countries.

These devices can work as independent note takers. They can also be attached to PCs or mobile devices and be used as braille output devices. Dotbook, which has been developed by IIT Delhi in collaboration with NGOs like Saksham, integrates many functions of a full-fledged PC.

Those people, who have been using computers and mobile phones for long with the help of screen readers and text-to-speech, would better be appreciating the fact that at times it becomes very irritating and taxing for the years to listen to the robotic speech continuously. The braille display comes in handy in such a situation. It can also be used as an input device replacing the traditional keyboard. The ease of use and the small size of the device is what makes them such a wonderful thing. People who can use braille would appreciate the power it brings to their hands. Listening to audio or e-text can seldom replace the power of text passing under one's fingers. These devices can be used in educational and work environments. They also have privacy implications. One can be sure that he/she is not being snooped upon by undesirable social elements.

2. Smart canes and accessible environments

Another great development in the field of assistive devices is the invention of the smart cane. The traditional white cane has helped the visually impaired immensely. However, it has its own limitations. It is almost impossible to detect obstacles above the knee height which often results in injuries on the upper body parts. IIT Delhi in collaboration with Saksham, Delhi has come up with a smart cane which can detect obstacles up to the height of one's head. It alerts the user of the incoming dangers through different patterns of vibrations. This can substantially augment mobility of the visually impaired. There are also other devices like the Buzzclip which is much smaller and can be worn on the shirt. It also functions in the same way.

As has just been mentioned, accessible environments are being created with the mobile phone being in the centre of the technology. There are several apps which can be installed on mobiles, android or iPhones, and be used for navigation. Some of such apps are as follows:

I. Microsoft Soundscape

This is a wonderful app available on iPhones. Although at present it is available only in US and some

European countries, it is expected to be coming to India soon. This app works in conjunction with blue tooth beacons placed at important locations along with maps from Google, Foresquare and Microsoft. One must wear headphones in order to maximise the benefit of the 3D sounds. It provides audio feedback in 3D mode. The user is alerted about the various locations as he or she walks on the road. This concept has also been used in limited indoor environments in India. In fact, this concept can be implemented with low investments in the restricted indoor environments.

II. Google LookOut

This app is available on Android but only on very high-end phones from google like Nexus and Pixel series phones. This app also provides a lot of information about the environment we live in. It can help the visually impaired in locating the things one is looking for. It performs a lot of other functions like reading printed text etc.

III. Clew

This app is available for iPhones and is meant mainly for use in indoor environments. You can keep records of many routes which you frequently use mainly inside buildings You can then use these routes for guiding and navigating efficiently. It would tell you well in advance about the approaching curves and stairs etc through audio instructions.

There is a big number of other apps which provide various kinds of facilities and are a great help in providing independent living for the visually impaired community. Some of them are DotWalker pro (Android), blindSquare (IOS) etc. There is a growing number of such apps and the number keeps getting bigger and bigger each day.

IV. Apps providing real time help such as BeMyEyes

There is a wonderful app called "BeMyEyes" providing real time human assistance to the user. This app is available on Android and iPhones. It's a kind of video calling app with a specific purpose of helping the visually impaired people through a worldwide network of volunteers, specially in the United States. When you sign up for the service, you have to choose the option between user or volunteer. If you are a user and you want some sighted assistance for some work, you can make a call which would be answered by a volunteer depending on his or her convenience. You can focus your mobile camera on some particular object and ask for help. This service has a lot of potential and it is being implemented by other companies as well. If a service like this could be started which could be based on subscription, it may provide employment opportunities to many and also would make life easy for many blind people.

V. Apps based on artificial intelligence

There are a number of apps like Seeing-AI, a free app from Microsoft available for IOS devices and Envision-AI available for both Android and IOS. These apps provide some wonderful facilities like handwriting recognition which was considered impossible till a few years back. Both offer features like reading text real time, text recognition, currency recognition, facial recognition, colour recognition, barcode

reading and scene description. There are other multi-purpose apps like Eye-D-Pro, Speak, Voice, Supersense ETC which provide a number of features like Hindi text recognition to the users.

VI. Taxi hailing apps

The taxi hailing apps like Ola Cabs and Uber have also simplified transportation needs of the visually impaired people in particular.

3. Book reading apps

There are a lot of apps fulfilling the educational needs of the visually impaired people. Voice Dream reader, which is available for both Android and IOS devices, has support for almost all file formats including Daisy audio and text. Amazon Kindle is another easy-to-use app on both the major platforms.

4. Dedicated devices for reading books

Some low-cost devices like Divyanayan are being developed in India which can make reading printed books much easier and cheaper. This device has support for a number of Indian languages.

5. Tactile graphics

IIT Delhi, IIT Chennai and some other companies have designed methods for printing tactile graphics. These graphics can be easily touched, felt and understood by the blind users. This has solved a big challenging issue in the education of the visually impaired students. People who are blind by birth, have little idea about different kinds of images. This has restricted their career choices as they are often forced to opt for arts subjects only. But devices like the Tactograph, are making it easier for the blind students to opt for science and engineering streams.

Challenges for the visually impaired people in availing assistive devices and services in developing countries

Although there has been improvement in the material conditions of the blind in India and other developing countries, the fruits of these have reached only a few and people specially from rural areas are still way far from getting benefits of the advancements in technology. The relatively high cost of the assistive devices is a major hinderance in this regard. The mobile phone has become an answer to many of the challenges faced by the visually impaired. The Android phones are available at different price points including in the range of 5000-10000 rupees. However, they are still very far from the reach of the rural folk. Another problem is that the low-cost phones do not last long and result in further financial loss to the users. The iPhones are relatively sturdier and more stable. Even the apps, that are available on both Android and IOS, work much better on iPhones. However, the high cost of these phones puts them largely out of the reach of the ordinary Indians.

Many NGOs are trying to minimise these challenges by subsidising the assistive devices through donations and government aid. However, much more leaves to be desired as these efforts are only helping a few and that too in a limited

way. There is a serious need for approaching the government so that pressure could be applied on the companies like Apple to provide phones at subsidised rates to the visually impaired and tax benefits could be passed on to them in turn. Such an arrangement could create a win-win situation for both the parties. Such an effort is hard to succeed unless the government is involved in this process. The role of NGOs is also very important in this regard. They can act as pressure groups for the achievement of these purposes.

As far as setting an accessibility agenda for next 4 years is concerned, the NGOs must strive hard to put pressure upon the government both at the national and state levels to implement accessibility provisions of the RPWD act 2016. Though there are a lot of important provisions in this regard, they are more in theory rather than in practice as far as implementation is concerned. Although efforts have been made for making the buildings accessible in cities like Delhi, there has been almost no effort in states in this regard. It is the responsibility of the NGOs to make efforts through lobbying and persuasion with the governments in order to get the accessibility related provisions implemented in letter and spirit. We must fix some target for ourselves as to how many buildings we would be taking up for making them accessible. First of all, we must make ourselves aware of the accessibility related issues and how they are resolved. This way accessibility for all can be ensured.

Efforts must also continue to reach the rural areas and making available assistive devices at cheaper and affordable rates. To start with some resource centres can be established in various backward districts and people of the area can be made aware so that Visually impaired individuals can come to these centres and can see the technology in action.

In conclusion it may be said that lots of advancements have taken place in the field of assistive technologies during last few years. Apps like Ola cabs and Uber have boosted mobility confidence among the visually impaired in a big way. But the fruits of all such developments are yet to reach the majority of the disabled population.

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