
USAGE OF ICT FOR VISUALLY-IMPAIRED STUDENTS IN HIGHER EDUCATION

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Abstract Higher education must be accessible to all and the higher educational institutions have a great responsibility of delivering the necessary contents both academic and administrative information that are important for the students. The higher educational institutions have taken many efforts to provide such contents to their students through various means like notice boards, public address system, digital boards, and digital library available in the institution. However some of the students miss out the vital information. The modern gadgets and other sources have diverted the attention of the students and therefore the institutions are expected to provide some additional sources to give such necessary information via the medium that they use frequently. One of the long-standing difficulties facing vision-impaired students has been access to educational materials, such as textbooks and classroom materials. The situation has markedly improved in recent years, as materials are increasingly available in electronic format, enabling vision-impaired students to access textual content with adaptive technologies, such as screen or Braille readers. The websites are undoubtedly the viable medium which is present in the internet or intranet and can be accessed even through a mobile phone at any time. Hence, the need to provide such necessary contents through the Web has been increased. But for vision impaired students, there are some obstacles for the effective use of the web content and other tools which may also have negative influence on the learning process. This paper presents the need for software tools for visually-impaired students in Higher education and the barriers that complicated their higher study opportunities and few layout recommendations to forming layout for web page design for visually-impaired students.

Keywords: Visually Impaired, Web Accessibility, Web design layouts, Web Content Accessibility, Web Personalization.

Introduction: Education plays an important role in shaping the life and future of every individual. Especially higher education will contribute to the development of the humanity and nation. The higher education opportunities provided to the visually impaired will certainly reduce the effect of their disability and develop their potentials adequately to face the challenges in their life. In order to provide equal opportunities, quality assurance in providing education to visually disabled person becomes more essential as it gives them societal acceptance. ICT Devices have changed the way of life which offers a culture of information, pleasure and relative autonomy, all of which are particularly appealing to young people and demands them to use it and thus ICTs become apart of youths. ICTs also have given an unlimited opportunity to everyone publish any contents and keep them available for everyone. The educational institutions are also utilizing these opportunities to provide the contents related to academic and administrative matters to their students and others [1].

Education for All (EFA) movement is a global commitment to provide quality basic education for all children, youth and adults by UNESCO, UNDP, UNICEF and the World Bank in 1990 [2]. The inclusive policy brought changes in the mind sets of educationists and educational institutions. There are hundreds of Visually-impaired (Visually disabled) given chance to access the higher education. Many Higher educational institutions have set up a modern computer centre and adapted assistive devices to

support them to access the materials available in the Web. However, the utilization of those resources is depending on the ability of the individuals and also the accessibility of the web.

Need for Software Tools: The higher educational institutions have a great responsibility of delivering the necessary contents to their students to qualify for a degree. The contents both academic and administrative information are important for the students to complete their degree on time. The curriculum and administrative contents required may vary from degree to degree, from department to department and person to person. The higher educational institutions have taken many efforts to provide such contents to their students via many media such as notice boards, public address system, digital boards, and digital library available in the institution. However some of the students miss out the vital information. The modern gadgets and other sources have diverted the attention of the students and therefore the institutions are expected to provide some additional sources to give such necessary information via the medium that they use frequently. The websites are undoubtedly the viable medium which is present all the 24 hours in the internet and can be accessed even through a mobile phone. Hence, the need to provide such necessary contents through the Web has been increased.

The Website and the Internet are very powerful Information and Communication Technology (ICT) tools for any educational institution to publish contents required for their stake holders and the public. To access the contents present in the website, not only the desktops and laptops but also the mobile phones are used. The visually-impaired, especially persons with no sight or partial sight may use some screen reading software to read and realize the contents present in the web and also to navigate from one page to another and to access all the contents of the pages in the web as they cannot read/see and use the mouse as others can.

Even though website enables to access the content from anywhere when connected to network, it has few restrictions for visually-impaired students like unable to obtain a bird eye-view of the screen, unable to understand the layout of items on the screen, unable to note dynamically changing visual content, small characters, crowded pages, popup windows, iconic menus, complex forms to be filled in and etc. The options available for personalizing or customizing the accessibility may not help all the time.

Due to the inclusive policy, many Visually-impaired students are given chance to pursue their higher education in Loyola College. The differently-abled are well versed in computer operation but cannot see the pictures/ videos on the screen and cannot navigate using mouse or with any other modern device. This paper presents the need for software tools for visually-impaired students in Higher education and the barriers that complicated their higher study opportunities and few layout recommendations to forming layout for web page design for visually-impaired students.

The Requirements of Software Tools for Visually Impaired Students: Students with disabilities especially visually-impaired may face difficulties both in “accessing and in “using” e-learning tools depending on the type of impairment, the types of obstacles encountered may vary considerably. The software products must be delivered meeting the accessibility requirements and needs of the users with disabilities. Especially when the visually impaired users are considered, usability aspects must be given top priority. The major functionalities available in the software tools must be able to be activated through short-cut keys irrespective of the operating system where the tool used. Necessary information such as information for identification, operation possibly handled and the status of the operation, controls and user interface components available so that the assistive technology can identify the functionality and interpret properly. The user interface elements which may disturb vision and/ or reading must be avoided. The information provided must be consistent across all the tools so that the visually-impaired users can adopt themselves and feel comfortable to work with the tools. There should be no overlapping or ambiguous functionalities. The active “focus” element of a user interface must be clearly identifiable. Identification and variation of the focus must be indicated at the application programming interface (API) level, so that the assistive technology can manage them. Other elements that require action by the user must also be adequately indicated. The user manual and supporting user documents must be made available in an easily accessible format [3].

Challenges of Visually-impaired in Accessing Web: There are lots of evidence found in the literature that visually-impaired cannot not use mouse and the screen that requires mouse operation is not possible to use for them. The image, photos and graphics are unusable which requires text descriptions or alternative text and longer explanations can be given in another page. They use a screen reader to listen to web pages which may skip navigational menus, long list of items, ASCII Art and other difficult items present in the web. They often use Tab key to move from a link to link and cannot follow the links out of context. The contents visually separable using frames are not seen all at once which requires appropriate frame titles to understand the text in the frames. The same problem exists in reading the contents present in the table format which may be presented with appropriate column and row headers to understand the contents in the table. The complex tables and graphs that are visually pleasing are unusable which requires the equivalent summaries and text descriptions. The image maps to locate content in a map are not supported in some of the screen readers that may require redundant text links to link the contents. The colors to classify the contents may not be useful which requires additional text to explain the differences. They use links to move from one page to another and can avoid scripts that may refer to content inside the same page[4].

The person with low vision also face challenges in recognizing the text in graphics for it does not enlarge or becomes pixilated when enlarged, it requires a limit or should eliminate text within graphics. They usually set their own fonts and background colors by offering text rather than text within graphics. The screen magnifiers reduce the usable window size which requires the relative units than absolute units. [4]

The people with Color-blindness cannot distinguish the difference between colors which requires the option to change the color or provide an explanation in the text itself [4]. However, the designers of a website have their own criteria to design a web site.

Layouts Recommendation for Creating Web Pages: The design of accessible web pages is not only a process in which general checkpoints must be kept in mind: 'Accessibility means maximizing the number of people who can use computer systems by taking into account varying physical and sensory capabilities of users. 'Web accessibility means that people with disabilities can perceive, understand, navigate and interact with the Web, and that they can contribute to the Web'. There are few layout recommendations suggested to follow while forming layout for web page design especially for visually-impaired students [5].

1. Visually-impaired users access different assistive technologies with a broad variety of functions. These functions have to be taken into account evaluating page structures and accessibility features.
2. Even if the visually-impaired users know only few features of the screen readers, they use the known features very confidently and instinctively. Users generally do not have to think about which key to press in order to execute a known function.
3. Experienced users rely to a set of different exploration and navigation strategies like using heading list, links list or the find feature. If one strategy fails, another could be applied. In order to support the preferred strategy, each strategy has to be considered during page design.
4. Although being experts with their screen reader, users will be novices of a newly visited site. If this site shows good accessibility such as presenting a well-defined and logical structure, skip links and/or other accessibility features, users will quickly learn about the page structure and layout and are able to interact confidently within the site.
5. Users configure their screen reader individually. Among the few settings which most users have changed, speech rate is the mostly adjusted one. This and individual Braille reading rates make it difficult to run a time-based analysis.
6. Before navigating in a website, visually-impaired users must navigate through a single page's elements and contents. Relevant information has to be detected; irrelevant content has to be skipped. Navigating on a page will be called 'microscopic navigation' to differentiate site-wide and page-wide navigation.
7. Verification of a focused-on element is extremely important in order to use the screen reader efficiently on a website. Normally, after skipping to an element, available meta information and the content of the element are checked before the next navigation step is executed

People with visual impairment are individuals who are blind, have low vision, or have colour blindness. The blind people need text equivalents for the images used on the Web page, because they and their assistive screen reader technology cannot obtain the information from the image. A person who has a visual disability will not find the mouse useful because it requires hand and eye coordination. Instead, this person must navigate the Web page using only the keyboard.

A person with visual disability will not find the mouse useful to navigate the website but prefers to access only through the keyboard. Normally the visually impaired users use Tab key to move the focus to an item that needs to be selected, a screen reader announces the item and then the user presses the Enter key while accessing the website. It is required to confirm that the design of the website is simple so that any visually impaired users can feel ease at use. There are few general principles proposed by Shaun Anderson [6] to designing website for visually impaired users as follows:

1. Text equivalents may be provided for all non-text objects on the page as speech synthesizers can't read graphics, and graphic text can't be enlarged in the same way as ordinary text.
2. All graphics should have text labels set with alternative attributes in HTML (Hyper Text Mark-up Language).
3. The web pages can be designed in a way that it allows the user setting their own browser preferences. The size for fonts or layouts designs must be dynamic.
4. Descriptive Titles may be used for every page.
5. Use valid HTML – many access programs depend on the use of standard HTML – e.g. some software can give an overview of the page by extracting all the headers and links and presenting them on a single page. If there are no headers on the page and all the links say 'click here' then the accessibility of the website will be very low.

The modern technologies will help the visually-impaired students to enjoy the benefits of ICT . V.S. Midhula Soman and K.G. Pillai Sudhier [7] have proposed the following suggestions which will bring success in educating the visually impaired students to effectively use the modern technologies.

1. Proper computer training should be given to visually-impaired students, which could reduce the barriers in accessing information.
2. Proper training should be provided to make them aware of the softwares and tools available in the mobile phones to access internet.
3. It is the responsibility of the institutions to take necessary initiatives in providing awareness about assistive technologies and to develop confidence in using them among visually-impaired students.
4. Visually-impaired students should be given motivation by conducting awareness programmes in using internet and electronic resources which helps to increase their confidence level in using these resources.

Conclusion: The essential purpose of using ICT in education for people with disabilities – the use of ICT is not an end in itself; rather it is a means of supporting individual people's learning opportunities. The paper has tackled the issue of the accessibility/usability of educational material on the web by visually impaired students. The important issues of their "accessibility/usability" have been addressed. The conditions in every type of inclusive educational area cannot be successfully created without the appropriate ICT tools applied. Assistive tools must be used to allow students with visually-impaired students to participate in the higher educational process based on special techniques and equipment. Few layout recommendations may be considered while forming layout for web page design especially when targeted towards the access of visually-impaired students.

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