Investigating the Applicability of Accessibility standards for disabled person on educational websites

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Abstract: - This paper exposes an approach to investigate accessible contents of educational websites to insure and measure its compliance with accessibility standards for visually impaired people. The W3C Web Accessibility Initiative (WAI) has been established to raise awareness of universal access. WAI develops guidelines which can help to ensure that Web pages are widely accessible. Assistive technology is used to increase, improve, and maintain capabilities of disabled persons to execute tasks that are sometimes difficult or impossible to do without technical aid. Also it helps them achieve their scholar, professional and social integration. We are mainly interested in assistive technology aimed to facilitate the use of a computer by visually impaired person. This study focuses on studying existing standards and investigating its applicability of educational institute websites. This will encourage accessibility of e-learning materials that are provided by these universities. We will take Jordan universities as our domain of study and present complete statistical outcomes along with recommendations to disseminate it.

Key-Words: - WAI, e-learning, disabilities, UAAG, CMC

1 Introduction

The digitization of many public services such as shopping, banking, and library which facilitate our daily life, allow people with disabilities to live in almost the same way as those who are not disabled [1]. With the huge amount of information available via the net, the academic people consider the Internet as an educational tool, which open new paradigms in learning as distance learning, and e-learning.

The aim of most governmental and educational institutions is to provide equate life for disable learner. E-learning considers as one of the solutions for this group of people, the e-learning philosophy aims to provide information and learning materials any where to any one. Any one implies indirectly disable learners, for example the learners who has physical disability like wheelchair-bound can access any e-learning resources without the need to move to university campus, and navigating around the buildings to lectures' rooms which might be difficult for them. However, there are other disabilities that should be considered when building any online webpage, or e-learning platform such as [2]:

- Vision problems, blindness, and colour blindness
- Hearing impaired,
- Cognitive or neurological disability

In European survey on e-learning for disabled people1, over half cited that there students suffer form hearing or visual disabilities; 17.5% listed problems with speech, over 30% mentioned learning difficulties; around a third respondents described the disability as physical, and 15% stated other types including mental illness, psychiatric problems, brain injury, and behavioral difficulties.

The Royal College for the Blind [7] addressed that e-learning via the Internet is well enable visually-impaired students to access more materials and work more independently than they could using traditional method. Moreover, the Computer Mediated Communications (CMC) help disabled learners in different aspects by improving the social life by enabling them communicating through emails, and chatting with other students in which learners overcome the problems of disability [3].

Barrett [15] stated the e-learning should not only be used as a mode of instructions, but also as a strategic tool for breaking down current educational barriers faced by students with disabilities in educational institutions. "As promising as the new technology is, there is still a lot of work to be done before eLearning is at its most effective, not least in raising public awareness" [16].

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1 http://www.disabilityworld.org/09-10_01/access/elearning.shtml
As a result, all e-learning website should be focused on how to make their websites accessible to disabled students.

The aim of this paper is to check if universities of Jordan websites are accessible by the disabled learners. Section 2 presents the guidelines to create an accessible website, evaluating some of Jordanian universities and results is shown in section 3, and conclusion is displayed in section 4.

2 Creating Web accessibility for disabled

Wattenberg [4] mentioned two ways to create an accessible website:

- Internet providers self-regulate their services in order to make it accessible,
- Allowing market forces to regulate the internet.

The web development is composed of four parts that should be taken into consideration to make this web accessible [10]:

- Web content which is the textual; visual or aural content such text, images, sounds, and presentation [11];
- Web browsers which are any software that gave a user access to website and provides graphical user interface to enable user to communicate with the browser such media players [12];
- Assistive technology which is a generic term that includes assistive, adaptive, and rehabilitative devices and the process used in selecting, locating, and using them such as: screen readers, alternative keyboards, switches, scanning software [13];
- Authoring tools which are any software or collection of software components that authors could use to create or modify Web content for use by other people [14].

According to Proughestaporn [9], it was necessary that several different components of Web development and interaction should worked together to be accessible to people with disabilities.

To ensure that the Web content have fair and equitable access to all people there are some checkpoints that are prepared by the W3C Web Content Accessibility Guidelines 1.0 that must be considered, which could be summarized as follows:  

- All text material should be available via sound for people who have vision problems or blindness.
- There should be text based description for all figures, pictures, and graphs.
- All sound resources should be transcribed, so people who have hearing impaired can access it.
- Be sure that the level of the language is simple, and appropriate for target audience.
- Avoid causing the screen to flicker as this can trigger epileptic seizures.

To make Web browsers and other user agents accessible, the User Agent Accessibility Guidelines or UAAG necessitates that [14]:

- User agents and Web browsers have to follow applicable specifications and conventions, to facilitate access by assistive technologies,
- To ensure that the user interface is perceivable, operable, and understandable.

In terms of assistive tools there are no clear guidelines for it, only concerns with providing enhancements and changed methods of interacting with the technology needed to support great independence for disabled learners.

Even though, there are a lot of input output devices that help disable learners to access websites such as: screen readers, Braille displays, onscreen keyboards and voice recognition, one of the barriers to access was the lack of authoring tools [9]. The W3C has developed guidelines to guide the developers of authoring tools called authoring tools accessibility guidelines (ATAG) which includes [14]:

- Authoring tools must facilitate access by assistive technologies;
- Authoring tool user interface must be operable, perceivable and understandable;
- Production of accessible content must be enabled,
- Authors must be supported in the production of accessible content,
- Accessibility solutions must be promoted and integrated.

So, Websites developers; especially e-learning ones; should take care off these components and how to make it accessible to all.

3 Evaluating Website accessibility

To evaluate the accessibility of Universities of Jordan we use two approaches:

1. Using online detecting tools
2. Then doing manual checking

There are some of online detection tools such as:

- Wave [17]: which is an online tool that allows user to enter the web address of a current site as shown in figure 1, and produce a number of icons to user's page that allows him to check potential accessibility issues. Red icons indicate accessibility errors; the yellow ones indicates alerts; while the green icons indicates accessibility features; and all light blue indicate structural, semantic, or navigational elements. Some of Wave icons are shown figure 2.
Figure 1. Wave Web accessibility tool

### Errors

<table>
<thead>
<tr>
<th>Icon</th>
<th>Title</th>
<th>Description</th>
<th>Recommended Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Error Icon]</td>
<td>ERROR: Missing alternative text</td>
<td>Alternative text is not present for an image.</td>
<td>Each image must have an alt attribute. That alt attribute should contain a concise, adequate, descriptive, and succinct alternative text for that image. If an image does not convey content, it should have a null alternative text (alt=&quot;&quot;).</td>
</tr>
<tr>
<td>![Error Icon]</td>
<td>ERROR: Spacer image missing alternative text</td>
<td>Alternative text is not present for an image used as a layout spacer.</td>
<td>A spacer image is typically used to control page layout. Supply null alternative text (alt=&quot;&quot;) if the image does not convey content.</td>
</tr>
</tbody>
</table>

### Alerts

<table>
<thead>
<tr>
<th>Icon</th>
<th>Title</th>
<th>Description</th>
<th>Recommended Actions</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Alert Icon]</td>
<td>ALERT: Suspicious alternative text</td>
<td>The alternative text: begins with &quot;graphic of&quot;, &quot;bullet&quot;, or &quot;image of&quot;, is an empty space (alt=&quot;&quot;), is an image file name (e.g., alt=&quot;photo.gif&quot;), or is one of the following: &quot;image&quot;, &quot;graphic&quot;, &quot;photo&quot;, &quot;photograph&quot;, &quot;drawing&quot;, &quot;painting&quot;, &quot;artwork&quot;, &quot;here&quot;, &quot;click here&quot;, &quot;click&quot;, &quot;logo&quot;, &quot;bullet&quot;, &quot;arrow&quot;, or &quot;more&quot;.</td>
<td>Change the alternative text so that it provides an equivalent alternative to the image. You do not need to inform the user that the object is an image (e.g., avoid &quot;Image&quot;, etc.).</td>
</tr>
<tr>
<td>![Alert Icon]</td>
<td>ALERT: Redundant alternative text</td>
<td>The alternative text for an image is the same as nearby or adjacent text.</td>
<td>Change either the alternative text or the adjacent text to eliminate the redundancy. In most cases, you can give the image null alternative text (alt=&quot;&quot;) because the content of the image is already provided in context through text.</td>
</tr>
</tbody>
</table>

Figure 2. Brief description about Wave icons
• Cynthia Says [18] which allows user to enter the URL and produces a table of potential breaches, so you can check them manually after that.

In Jordan there are 30 universities, 10 of them are public universities and the rest are private ones. To check the accessibility of universities websites, we select 6 universities that are the most popular ones, three of them are public and three are private, including the Arab Open University where I work.

Table 1 and figure 3 show the selected Jordanian universities with their detected accessibility errors that are founded by Wave tool. The numbers in the table represent errors without including alerts.

Table 1. Number of accessibility errors at some Universities of Jordan Websites

<table>
<thead>
<tr>
<th>University name</th>
<th>Number of accessibility errors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hashemite University</td>
<td>65</td>
</tr>
<tr>
<td>Irbid private University</td>
<td>7</td>
</tr>
<tr>
<td>Israa University</td>
<td>14</td>
</tr>
<tr>
<td>Jordan university of Science and Technology</td>
<td>6</td>
</tr>
<tr>
<td>Mutah University</td>
<td>28</td>
</tr>
<tr>
<td>Arab Open University</td>
<td>28</td>
</tr>
</tbody>
</table>

The number of accessibility errors appears in table 1 were needed double checking because some universities use different tools in building their websites, some tools force developers to fill for example text for each image. However, the Wave tool checks if there is a text describing each image but not able to check if this text represent the image correctly, because of this we need manual checking for these features.

Taking for example Jordan University of Science and Technology, figure 4 shows the output screen produced from Wave. By analyzing the output, we found that:

• There are 6 accessibility errors, most errors (red icons) represent empty links, a link without text description, and it is required to add meaningful text.

• There are 15 structural and semantic icons, where 13 of them indicate that a title attributes are used and it required ensuring that the title is brief and informative. The other two icons represent unordered lists which is required to ensure that an unordered (bulleted) list is appropriate for the context (i.e., the list items are parallel).

• Eight icons indicates that a table layout are found and it is required to ensure that the table is indeed a layout table and that it does not contain tabular data. If it is a layout table, eliminate all header cells (e.g., change <th> to <td>).

• Only one green icon appears that represents that a text is found to describe a link, but still another checking is need to see if the description is informative.

![Number of accessibility errors](image)

Figure 3. Statistics shows web accessibility errors
• There are 25 alert icons (yellow one), 5 of theses alerts represent Link text does not make sense out of context, contains extraneous text (such as "click here"), or is the same as another link on the page, but links to a different location, these links need to be reworded in a representative way. Four of the alerts show that the links will open a new popup window; the user should be informed that the link will open a new window or in the same window. Six of the alerts indicate that there is an event handler which requires to:
  o Ensure that the event handler is device independent (does not require a mouse or keyboard) or that multiple event handlers are used to allow for both keyboard and mouse interactivity.
  o Ensure that the actions that are performed as a result of these event handlers do not introduce accessibility issues.
  o Ensure that this event is only attached to elements that can receive keyboard focus (<a>, <input>, etc.).
  o If an onmouseover/out effect is only cosmetic (e.g. it causes an image to "glow" or to change color), no change is necessary.
  o If the onmouseover/out effect exposes new content, this content will likely not be accessible to most assistive technologies. Provide a redundant, alternative way to access the same content or remove the mouse-over effect.
• Three alerts indicate the existence of Java script which requires ensuring that the javascript does not require the use of a mouse or introduce other accessibility issues.
• Another 3 alert icons indicate the existence of flash objects, and it is advised to do the following:
  o If the Flash object does not present content, hide it from screen readers.
  o If content is presented, provide an HTML alternative and/or make the Flash object natively accessible, including providing captions for any embedded video-type content and ensuring that the Flash object is keyboard-accessible.
• One alert means a link to word document is found in which it is needed to provide an HTML alternative and/or ensure the Word document is natively accessible.
• One alert indicates the missing of a form element label, and it is recommended to ensure that the title value adequately describes the functionality of the form element.
• An alert icon represents the missing of a headings or document structure. Another alert icon indicates that an access key is found and it is recommended
not to use such access keys due to potential conflicts with browser and screen reader shortcut keys.

This case is not only known in universities of Jordan, Arrigo [1] reported that the number of educational institutions which have provided courses and degree programs via e-learning mode has been growing grammatically since the middle of 1990s. However, Waits and Lewis [5] stated that 33% of US institutions that offered distance courses in 2000-2001 did not know if their web sites followed accessibility guidelines, 28% followed the guidelines to a moderate extent and 18% followed the guidelines to a minor extent. Other research revealed that most of the US institutions for distance learning are inaccessible by disabled learners [6].

4 Conclusion

We have presented in this paper the importance of making website content accessible and user friendly by disabled person. The W3C Web Accessibility Initiative (WAI) has been established to raise awareness of universal access. WAI develops guidelines which can help to ensure that Web pages are widely accessible. We also investigated accessible contents of educational websites to insure and measure its compliance with accessibility standards for visually impaired people. We are mainly interested by assistive technology aimed to facilitate the use of a computer by visually impaired person. Our preliminary study focused on studying existing standards and investigating its applicability of educational institute websites. We took Jordan universities as our domain of study and presented complete statistical outcomes along with recommendations to disseminate it. We also presented a comparison study among educational websites in Jordan. The main outcome concluded there are still needs in the developed countries to put standards on education website to make sure it is complied with international accessibility standards.

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