E-Learning COach for Visually Impaired People

TUTORIAL
S1 "*ASSISTIVE TECHNOLOGY*"

Appendix "The Golden Rules of Accessibility"

Official course tutorial for the E-COVIP examination

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1 Content

2   Introduction

In this appendix "The Golden Rules of Accessibility" for the tutorial "Assistive Technology" readers get additional background information on essential aspects of how to provide and enhance the accessibility people with visual impairments have to e-learning components.

3   Learning Aim

In the appendix "The Golden Rules of Accessibility" learners will be sensitised for essential features e-learning component should have in case they are supposed to be used by visually impaired and blind persons.

After the self-study phase and the practical period learners will understand the accessibility challenges visually impaired and blind computer users are faced with when attending e-learning or blended-learning courses.

3   The Golden Rules of Accessibility

These rules have been formulated by the Consortium for E-Learning Accessibility (C4EA).

1. The structure of an e-learning system should always be coherent and logical. This applies to the design of tables, frames, buttons and links.

2. Every essential and important piece of information should be available in an audible, visually legible and palpable form. This applies to forms, text, images and multimedia.

3. The e-learning system should have an easy-to-use navigation.

4. The e-learning system should allow for customization and adaptation. This applies to font, colours as well as the history and bookmark functions.

5. Every e-learning system should be provided with at least one accessible user help element.

(http://www.c4ea.org)

3.1.   Comfortable URLs

Using URL addresses that can be easily chosen by users gives them quick and direct access to pages, e. g., to those with log-in forms. The shorter and the more meaningful the navigation path to such a page or file, the easier it is to type and possibly to remember the path. So we may say that a short and meaningful path helps to find information as well as to have orientation within a system.

In practice the following problems occur:

- Paths are very cryptic; they consist of a seemingly arbitrary combination of numbers, punctuation marks and letters that do not really make sense to a human mind. Users of screen readers must spend a certain amount of time listening to a vast number of sheerly meaningless signs.

- Paths are very long and thus do not allow for orientation.

Thus we recommend the following activities:

- Make sure that the names of the directories and sub-directories of your paths are always meaningful and give an idea about the contents of the respective directory. This is especially beneficial to users of screen readers.

We recommend restricting the number of directories within a path to between five and (absolute maximum!) nine (http://www.c4ea.org).

3.2. *Forms*

On the web, there are two primary means for receiving information from a web site - e-mail and forms. E-mail usually does not entail any major accessibility problems. In addition, allowing web site users access to a contact e-mail address is a great usability and accessibility feature. Forms often provide a better means of communication. When forms are used, information can be submitted easily, so that an e-mail program or web service is not required. Moreover, you can also get the specific information needed. But in contrast, there can also be accessibility problems.

When we talk about the accessibility of forms, we usually refer to the possibility to use them by means of screen readers especially developed for visually impaired people. Those with other types of disabilities are generally less affected by faulty forms without some of the HTML accessibility features. It should be noted, however, that everyone benefits from a well-organized form, especially those with (e. g. cognitive or visual) disabilities. Visual layout can, therefore, also be important to those who have sight. The less explanation a form needs the better. Still, the focus is mainly on making a form that can be displayed by a screen reader.

Forms are a powerful way of gaining information from the user. Common form elements are:

- text boxes in which users can type information;
- check boxes to let users select one or more options;
- radio buttons to let users select one option from several choices
- buttons that let the user clear the form or submit their information.

Forms must follow interface control guidelines in general. But when a large number of interface elements is displayed together in a single form, problems can arise that require other solutions.

When electronic forms are designed to be completed on-line, the form should allow people who use assistive technology to access the information, field elements and functionalities required for completion and submission of the form, including all directions and cues. Make sure all form controls have text labels and all form elements have labels associated with them in the mark-up (i.e. the <id> and <for> parameters, both of which are HTML elements).

Common form accessibility problems include:

- illogical tab order among controls

- complex layout of controls that makes it difficult to determine which label matches which control, or to determine how a series of controls are related to each other
- form fields in search utilities that do not support keyboard navigation
- visual-only modifications to form fields that users must perceive in order to proceed
- colour-coded areas or areas flagged with an image signal that a given field must be filled in or than an error has been entered.

Developers of learning systems may enhance the accessibility of forms for all users by paying attention to the following points:

- Make sure that the tab order makes sense.
- Use programmatic means, if available in the development environment, to indicate which label applies to which field.
- Make sure that all actions can be carried out by means of the keyboard.
- Do not rely on colour as the only medium for conveying information. For example, if the interface uses red text to indicate that a field is required, also include the word "required" next to those items.
- Provide a means for users to easily locate and correct form.

Content creators or trainers may enhance the accessibility of forms for all users by following these practices:

- Use meaningful labels for each form item.
- Place a default value in edit boxes or on the top line of drop-down lists.

(http://www.c4ea.org)

3.3. Alternative Procedures and Access

Every person learns in a highly individual way. Ideally, on-line learning allows each user to interact with lesson material in his or her preferred way, relying on their individual strengths. The principles of excellent software design call for developers to work with a profound knowledge of the range of human skills and limitations. Software designers of teaching materials and activities, in particular, must strive to achieve this high standard.

When a user has a disability, the access to learning software may depend entirely on how flexibly that product can deliver its content, i.e., what adaptation and customization functions are implemented and integrated into it. Some users may only need to modify the parameters in which media are presented; other users may require entirely different media. Developers who achieve the kind of flexibility that diversity requires will enhance the accessibility of their product.

At least developers should provide text representations for all media types. This basis will support the access for many users. Moreover, it deserves mentioning that users with learning disabilities benefit from graphical presentations as well. For this reason, the practice of providing text-only content as an alternative to inaccessible multimedia content may not be an effective solution for users with cognitive disabilities.

A number of resources with information on flexible media delivery is currently available. The W3C Web Accessibility Initiative provides accessibility guidelines for W3C technologies such as HTML, XML, SMIL and CSS. It also provides more general guidelines for web-content accessibility, authoring-tool accessibility, and user-agent accessibility. Two other comprehensive guides are referenced here.

As an alternative method of accessing equivalent functionality provided make sure this method is clearly visible and usable. This could be a standard HTML link to an HTML page or text file for page information, an alternative text with an image (alt) or descriptive text with a link (title).

Common types of media delivery and associated presentation formats are text, images and multimedia. On each one you will find additional information in the now following paragraphs (http://www.c4ea.org).

3.3.1. Text

When text is correctly structured and formatted, it can be the most flexible way to present content. To make distributed online learning accessible, developers of learning material must provide a means to render digital text in alternative formats. Specifically, it should be possible to render text as:

- **Visual information**
  Text can be displayed on computer screens or other electronic devices (e.g. personal digital assistants, cell phones, e-book readers).

- **Audio information**
  Text can be translated into speech by means of recordings or via synthesized speech provided by a computer.

- **Tactile information**
  Text can be displayed on refreshable Braille displays or printed by means of a Braille embosser.

Common text accessibility problems include:
- fixed font sizes that prevent users from changing style, size and colour choices
- text presented with background images or poor contrast colours that hinder readability
- text presented in an image format that screen readers and Braille displays cannot transform
- multi-column formats (including some tables) that screen readers cannot process in the correct order

Learning system developers may enhance the accessibility of text for all users by paying attention to the following points:

- Offer features that allow the user to customize fonts and backgrounds.
- Allow assistive technology to have access to the source code.
- Use validated XHTML.

Content creators or trainers may enhance the accessibility of text for all users by paying attention to the following points:

- Choose text formats that offer the most accessibility (e.g. XHTML, plain text).
- Use true text, but not graphical representations of text.
- Structure the text appropriately, identifying headings and other structural elements.
- Use styles or style sheets so that users of assistive technology are put in the position to choose the settings for the display of content.
- Integrate a bookmark or history function to make accessibility and usability still easier.

(http://www.c4ea.org)

3.3.2. Images

Images can provide essential information. But without text, images are not accessible to blind or low-vision users. Developers must provide an option for users to access visual information. Providing text identification, or alternative texts, will also be beneficial to users of text-only browsers (e. g. Lynx, browsers with mobile phones). In addition to that, developers should make sure that images are scalable, so that users can enlarge them for more clarity and better recognizability.

Common image accessibility problems include:

- no or insufficient alternative text provided
- images with a low resolution that are hardly or not recognizable at all when enlarged

Learning system developers may enhance the accessibility of images for all users by following these recommendations:

- Provide a means to include text alternatives of images.
- Provide a zoom feature.

Content creators or teachers may enhance the accessibility of images for all users by following these recommendations:

- Provide text alternatives for images.
- Use the highest practical resolution for bit-mapped graphics.

(http://www.c4ea.org)

3.3.3. Multimedia

Multimedia is the combination of text, graphics, video, animation, and sound (audio). Thus, a given piece of multimedia content combines the access needs of each media type included. Multimedia can be useful for many groups of learners, since a multi-modal presentation of information can be easier to understand. In general, users benefit from the availability of various media types.

Common multimedia accessibility problems include digital videos without captions, transcripts or audio descriptions. Learning system developers may enhance the accessibility of multimedia for all users by including accessibility features such as captions, transcripts, and audio descriptions, within the multimedia format provided by the application.

Content creators or teachers may enhance the accessibility of multimedia for all users by following these pieces of advice:

- Follow all relevant suggestions for enhancing accessibility for text, audio and images, since multimedia can combine all of these elements (cf. 8.3.1. and 8.3.2.).
- Provide audio descriptions describing essential visual elements for video content.
- Make sure sounds can be turned off and on manually.
- Consider the importance of the timing of media delivery when planning access features. For example, a "talking head" video may need only a stand-alone transcript of the audio, but a documentary including graphics and other important visuals may require captions in order to maintain the link between visuals and narration.
- Pay attention to the fact that many visually impaired people choose low screen resolutions such as 800x600 pixels or even 640x480 pixels.
- Consequently, avoid parts of the page being "chopped off"; horizontal scrolling should not be necessary to get all information on a page.

In addition to that, an accessible multimedia player is of utmost importance especially for blind people. Instead of developing one, however, the employment of the *Classic Media Player* which offers a skin controllable by means of special keys integrated into easy-to-use multimedia keyboards may make sense.

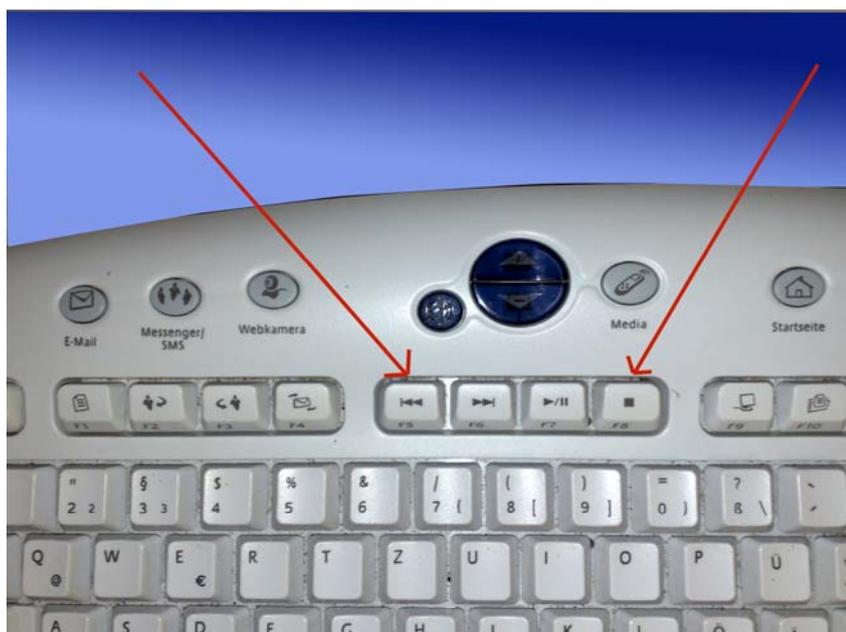**Figure1: Multimedia Keyboard by Logitech**

Figure 2: Keys for Controlling Multimedia Content (with red arrows)

Although the guidelines on hand mainly refer to visually impaired and blind people as the target group, we should not forget to take into consideration the problems other people are faced with concerning aspects of accessibility and usability. For people with hearing impairments developers should integrate subtitles into video or audio sequences or simply provide explanatory text documents. One more really useful solution is to provide additional booklets with time-code references; so that users get information on the outline of a presentation or sequence (http://www.c4ea.org).

3.4. Navigation

Many users of assistive devices encounter difficulties trying to use features normally accessible by means of a mouse only. Making the interface overly mouse-dependent will certainly cause difficulties for users of assistive technology, especially when users navigate through content and try to access elements such as menu bars, tables of contents and frames.

It is essential that learning systems follow a very well-structured approach and have a navigation that is logical, coherent and similar on every part of the system. Use links and shortcut keys and make sure a lot of functions can be reached with shortcut keys (<**ALT**>+<**Letter**>).

Common interface navigation accessibility problems include:

- indexing or navigation systems that use complex frames where the title or name attribute is missing
- tables of contents with "maximize" and "minimize" features (e.g., blue triangles, plus-minus signs) that lack text labels
- menu bars developed on the basis of scripting languages that are not compatible with assistive devices

Learning system developers may enhance the accessibility of interface navigation for all users by bearing in mind the following recommendations:

- Provide names, titles, or text labels for each element of the interface (not longer than 80 characters).
- Make sure that all parts of the interface can be accessed by the keyboard. Clearly document all appropriate keystrokes (e. g. shortcut keys, "hotkeys"). These are extremely useful especially for very important links within the system.
- Provide a "tab-friendly" handling of the product or system. So the user should be put in the position to follow the arrangement of links and objects within the product or system. Every link on every page should be achievable by means of the <**TAB**> key.
- Especially take care for a clear, coherent and logical navigation. First and foremost, provide meaningful paths instead of cryptic ones so that the user can easily find orientation within the system and possibly insert the path aimed at manually. Moreover, offer a consistent navigation mode, i. e., navigation by means of "forward" and "backward" buttons to the respectively preceding or following page, e. g., within a lesson a learning unit should not be omitted.

Make sure that all Windows shortcut keys (e. g. <**ALT**>+-<**F4**> for closing a window or <**Ctrl**>+<**TAB**> for jumping from one frame to another one) and hotkeys (e. g. <**TAB**>) are also available and do not interfere with especially defined shortcuts and hotkeys.

Always provide short and logical paths displayed in the status bar, which guarantees a better orientation for impaired users in contrast to very cryptic ones (with a sheerly chaotic sequence of letters, numbers and punctuation marks).

Also pay attention that every essential button or link is always on the same position on every page. Furthermore, it should always lead to the activation of the same function. Thus a coherent structure is provided (http://www.c4ea.org).

3.4.1. Positioning focus/ cursor

A well-defined on-screen indication of the current focus shall be provided that moves among interactive interface elements as the input focus changes. The focus shall be programmatically exposed to assistive technology that can keep track of the focus and focus changes.

Even if the software provides keyboard access, the user does not virtually automatically know where he or she is. Keyboard users must be able to see the current focus point to know what to do. Imagine typing if you could not see the caret.

Assistive devices (e.g. screen readers, screen magnifiers) need to know and display the position and contents of the visual focus indicator; so objects can be described, magnified or manipulated for the user. When editing, the caret is the visual focus. As a blind user moves the focus with the arrow keys, a screen reader must know the position of that focus so that it can read out the current character, word or line. Similarly, as a user tabs around in a dialogue, a screen magnifier needs to follow the visual focus (http://www.c4ea.org).

3.4.2. Positions and Locations

The two customizing function history and bookmarking are rather expedient for users in general, but for (visually) impaired ones especially. Both make possible a more direct access to the content, a "shortcut" in the best sense of the word. Furthermore, information on the position and on the status of the system contributes to the orientation and a certain safety in working with the system (http://www.c4ea.org).

3.4.3. Links

Basically, although it sounds trivial, it is vitally important that all link names are easy to understand; but you will agree to the statement that the user should not feel forced to guess what or where the links on hand might lead him or her to. In addition to that, links with the same (meaningful) wording should lead to the same page, position or function within the e-learning system. Furthermore, the number of links available should be easy to handle, we suggest at best 40 links on one page. Take into consideration that – so to speak as a "worst case" scenario – an e-learning system should be controllable by means of the keyboard only. Hidden links, of course, are allowed, but should not be too many and easily accessible by means of keyboard only. Generally, take care that the naming and the functions of the links make sense according to the context they are placed within; some assistive devices (e.g. screen readers) can indeed display links as a list, so that navigation is made much easier and orientation augmented (http://www.c4ea.org).

3.5. Formatting and Presentation

3.5.1. Tables

Tables are useful for displaying information in rows and columns and are also sometimes used to present material on a web page. If a table is not properly designed, then assistive technology like screen readers cannot intelligibly render the information to the user. Consequently, the user is left "lost" and unable to discern the information contained within the table.

In addition, properly formatted tables enable web authors to add supplementary information such as captions, summaries, and column and row headers to better inform the user about the "message" found in the table. On this page, you will examine how to properly design tables to convey information in an accessible modality. For understanding table data, you have to know how the individual cells fit into the overall table content. A quick glance at the web page is usually enough for a sighted user to gain at least rough orientation, but people with visual disabilities need more time. With just a few changes, you can make your tables accessible to all users.

Focus on the following properties of the table and use them correctly:

- Use caption and summary elements
- Use column and row headers.
- Do not merge and split cells, rows and columns (http://www.c4ea.org).

3.5.2. Frames

A frameset is a page which defines a collection of at least two other separate pages, which are combined in the same visual space. Users without severe visual problems usually experience framesets as a cohesive entity. They can scan the contents of multiple pages all at once.

Those who use screen readers cannot quickly scan the contents of multiple pages. The complete content is experienced in a linear way, always only step by step (e. g. frame by frame). Frames are not inaccessible to modern screen readers, but they can be confusing, e. g. if the menu items are not to be found in a logical order or if it is not possible to easily jump from one frame into another one.

Screen readers usually read all of the frames in a frameset, almost as if they belonged to the same page. The user is alerted that a frameset is present, and then continues to read all of the pages in the frameset.

To make frames accessible use the following guidelines:

- Provide meaningful titles for frames which describe the function of the respective frame.
- Provide meaningful <noframes> content.
- Never use more than three frames on one page

(http://www.c4ea.org)

3.5.3. Colour

If only colour is used to convey information, people with colour blindness and users with devices that have non-colour or non-visual displays will not receive such pieces of information. When foreground and background colours are too close to the same hue, they may not provide sufficient contrast when viewed with monochrome displays or by people with different types of colour deficits.

Two colours are considered to provide good colour visibility if the brightness difference and the colour difference between the two colours are greater than a set range. The range suggested by the W3C is > 125 for colour brightness and > 500 for colour difference.

Consequently, the following aspects should be borne in mind:

- Use on-line tools to check the values for colour brightness and colour difference.
- Ensure that all information conveyed with colour is also available without colour, for example from context or mark-up
- Ensure that foreground and background colour combinations provide sufficient contrast when viewed by someone having colour deficits or when viewed on a black and white screen.

Make sure that you have a colour difference of at least 500 and a colour brightness of at least 125 (http://www.c4ea.org).

3.5.4. Font style

The best practice is to use the most easily readable fonts. Unfortunately, this is easier said than done. Experts do not always agree which fonts are the most readable or which ones are most appropriate for screen use. There are thousands of fonts and font variations that could potentially be used on a web site, but the vast majority of these fonts will not work for most users on the web because computers can display only the fonts installed on them, and not with all computers the same fonts are available.

Fonts without serifs have plain endings, and appear blockier than fonts with serifs. They do not have flared extensions, strokes, or other kinds of ornamentation. ("Serif" refers to the extra strokes, or lines.) Fonts without serifs are, e. g., Arial, Tahoma, Trebuchet MS and Verdana. People with dyslexia and vision problems prefer fonts such as these mentioned above (http://www.c4ea.org).

3.6. Help and Support

3.6.1. Help

Developers of e-learning systems should provide some kind of documentation in at least one accessible format.

Some users may not be able to access the documentation, if it is not in an accessible format. If any documentation is provided in multiple formats, at least one of the formats must be accessible.

Provide the documentation of your e-learning system in at least one accessible electronic format. For example, if you provide equivalent documentation in both PDF and HTML, only one of them must be accessible. Since screen readers support HTML without any problems and PDF documents have to be made accessible explicitly (as so-called "tagged PDF" documents), the HTML version of the documentation is recommended to be the accessible version.

The following techniques are the minimum requirement for making the documentation accessible:

- Adobe PDF
- HTML
- Javadoc and JavaHelp
- Microsoft Office
- plain text

(http://www.c4ea.org)

3.6.2. System information

Developers of e-learning systems should not refrain from integrating accessible system information, which can either be part of an accessible user help component or integrated into the source code of the e-learning system. The required elements (plug-in tools, hardware, and software) should be clearly documented for installations and users alike (http://www.c4ea.org).

3.6.3. Support

Developers of e-learning components should also provide accessible support forms. So, e. g., contact information should be easy to find (either in a written or maybe acoustic form). If a mail form is used, all form fields, buttons and possibly elements for text formatting (e. g. font size, font colour, and maybe smiley palette) should be accessible by means of the keyboard. Furthermore, if screen reader software is in use, audible information on components should be included (http://www.c4ea.org).

3.7. Summary

To put it in a nutshell, designing and developing an e-learning component – either a learning-management system, a CBT, a WBT or a virtual conference system - should be guided by an overall basic rule: **KISS** (**K**eep **i**t **s**imple and **s**tupid). The software should be designed in the simplest way, creeping featurism should be strictly avoided. Of course, there is nothing to say against a rather charming presentation of information. But an e-learning component developer should always bear in mind the (disabled) user's needs. The accessibility of the system and the usability of its components should always obtain priority and thus be the principle of thoughtful development and well-structured design. Furthermore, a self-explanatory, easily comprehensible and intuitively controllable e-learning system will be of utmost benefit and importance for the user.

For further information on questions of accessibility readers may consult the Accessibility Guidelines developed by the E-Learn-VIP (E-Learning for Visually Impaired Persons) project team (http://www.e-learn-vip.org).

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