

## **WIKIPEDIA, THE OPEN ENCYCLOPAEDIA: IS IT REALLY OPEN TO BLIND USERS?**

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**Abstract.** Nowadays Web 2.0 applications allow anyone to create, share and edit on-line content, but accessibility and usability issues still exist. In this direction, wikis are becoming increasingly widespread, and offer great benefits in a variety of collaborative environments. To be universally valuable, wiki systems should be easy to use for anyone, regardless of ability. This paper describes obstacles that a blind user may encounter when interacting via screen reader with Wikipedia. For instance, Wikipedia presents many difficulties for the blind, especially when they wish to edit articles. Based on these accessibility issues, our study is aimed at investigating on the W3C ARIA suite as possible solution to simplify the Wikipedia Editing Page when interacting via screen reader. At the end, a user testing conducted by involving a group of blind users is shortly described.

**Keywords:** wiki, e-Learning, Accessibility, usability, blind users

### **1. Introduction**

Wikipedia is the best-known Free Encyclopedia available on-line, based on MediaWiki free SW. A wiki is software that allows users to create, edit, and link web pages easily, in a collaborative way. Wikipedia's articles have been written collaboratively by volunteers from all around the world, and the vast majority of its articles can be edited by anyone with access to the Internet. Thus, each encyclopedia entry requires contributions by multiple authors that are then integrated into a single description.

Collaborative environments allow multiple users to share content creation. Thus simplicity is crucial for universal participation. For the blind, who cannot use screen and mouse, and are obliged to interact through assistive technologies (i.e. screen reader and voice synthesizer) the interaction is much more complex. Therefore, it is important that user interfaces are designed according to accessibility and usability principles to assure the system is "open" for anyone.

In this paper we analyze Wikipedia UIs (<http://www.wikipedia.org>) in order to understand how the blind interact with wikis via screen reader. The main functions that characterize a wiki system will be considered when evaluating the usability of the interfaces. In the following we introduce the methodology used to evaluate the Wikipedia UI and describe issues related to interaction via screen reader. Next, a possible solution on how the interaction could be improved by using ARIA suite and the results collected through a user testing are reported. Conclusions completes the paper.

## 2. INTERACTING WITH WIKIPEDIA

The page of any Wikipedia entry appears visually simple. Section contents are enclosed in boxes. On the left side, under the logo, there are five menus: navigation, interaction, search, toolbox and languages. In the upper right corner there is a link for log-in/create-account. A tab style format in the center and right of the screen includes four entries: article, discussion, edit this page and history. Wikipedia has two states: read and edit. The default is read. User may enable the edit state by clicking the link "edit this page" at the top of the page, in the body content section. Augar et al. observed that wikis that support a simple edit style by including an editing toolbar are easier to use than those requiring a knowledge of wiki syntax (Augar et al. 2004). In the following we will discuss how a blind user interacts with Wikipedia pages.

To evaluate accessibility and usability of Wikipedia when interacting via screen reader, we selected and analyzed three kinds of pages: (1) the home page, (2) the search and result page, and (3) the edit page and functions, by using the screen reader Jaws for Windows (FreedomScientific) v. 9.0. and 10.0. We used both the MS IE version 7.0 and the Mozilla Firefox version 3.0 browsers.

Wikipedia is available in many languages. We tested both the English and Italian pages in order to understand whether language-based versions have the same or very similar user interfaces. Although some little differences have been identified between the two interfaces, the problems identified are in effect the same.

### 2.1 Home page

Accessing to the Wikipedia home page, the main accessibility and usability issues when interacting through a screen reader can be summarised as follows:

- Graphical links. JAWS provides the list of all links in the page (CTRL+F7 command). If graphical links do not have any alternative description, the screen reader extracts (from the <src> element of the <img> tag) and reads the directory/filename, which may be meaningless. In the tested home page several graphical links do not have any alternative description (e.g. links like 'bd/Wiktionary-logo-51px').
- Number of links. The page contains too many links--over 300 in the English version. A more appropriate number of links on a single Web page should be considered.
- Search edit fields. The search edit field is not labelled, so the user needs to understand the purpose of the edit box from the context as well as from the search button labels. In this case it is important to observe that the use of different browsers changes the code announced by JAWS. Interacting with the Firefox browser, JAWS reads the labels of push-buttons (i.e. 'Go' and 'Search'), ignoring the 'title' attributes. Instead, using the IE browser, Jaws perceives the tool-tip assigned to the two push buttons (i.e. 'Go to a page with this exact name if one exists' and 'Search the wiki for this text'). Thus with FireFox the user is unable to understand the type of search since the difference between 'Go' and 'Search' is not clear. Obviously this depends on the specific implementations of JAWS and the browser version, and should improve with future versions.
- Lists. For various groups of links no list has been used (or Links are not grouped in lists). Each item is marked with a '.' instead. An ordered or unordered list is suggested. In this case the user would be able to move from one list to the next one, by using a screen reader special command (e.g. for Jaws the 'l' key).

### 2.2 Search and results page

In order to evaluate the results page, we searched for a topic in the English Wikipedia Web site. We typed "e-learning" in the search edit and pressed Enter. Since two different search modalities can be carried out, two buttons can be used to search for: "Go to a page with this exact name if one exists" or "Search the wiki for this text". In the English version we assume that the first one is activated when pressing the Enter key; whereas the second has to be selected through the Tab key before pressing the Enter key. It is different for a sighted user when using the mouse, because he/she picks up the buttons before clicking on it. Unfortunately no label has been used for the edit field. The user has to

guess it is the "search edit field". To improve usability a clear label (such as a hidden label) should be assigned to the search edit field(s).

If the search succeeds, the first line read by the screen reader contains the keywords. For example, if the search word is "e-Learning", the first line is "Electronic learning From Wikipedia, the free encyclopedia". When no result is found, the first line perceived in the page is "Search From Wikipedia, the free encyclopedia". In the latter case the result message is not clear enough for new users unfamiliar with the Wikipedia UIs. Two clearer messages could improve usability in searching for contents. For example, messages like "No result found for..." or "Results for..." would make navigating Wikipedia easier.

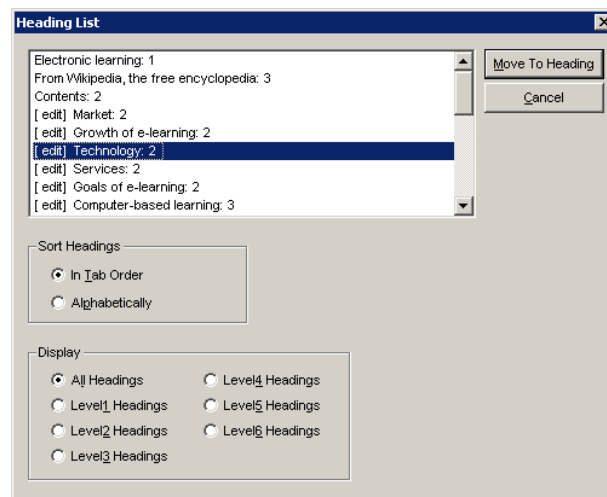


Figure 1 – Wikipedia English version: result of e-Learning search. List of headings levels provided by JAWS

When the topic is found, the result page contains a great deal of information. Fortunately, all main page result sections can be recognized by using heading levels, which improve the page structure perception via screen reader (Yesilada et al. 2004) and (W3C). Although Wikipedia applies heading levels - i.e. <h1>, <h2>, etc. - the content used is not clear, in terms of usability via screen reader.

All main content sections start with "[Edit]..." (Figure 1). In the visual layout the "[Edit]" links are positioned on the right side, thus do not impact on the visual reading. When a blind user gets the list of headings -- by using the JAWS command Insert+F6 -- in order to understand the available sections, the reading becomes tedious and slow due to the presence of "[Edit]" before the section title (to better understand, try to read aloud each square parenthesis and title). In addition, moving over a specific section by using the first letter of the wanted title is not possible (since each section name starts with the character "[").

### 2.3 Editing modality

The Editing modality is the most complicated UI in terms of usability via screen reader. To evaluate the editing modality, we used the "Sandbox" tool made available by Wikipedia to carry out experiments, shown in Figure 2. Figure 3 reports a portion read by Jaws.

The main accessibility problems as well as usability difficulties encountered when interacting with this kind of page and functions can be summarised as follows:

- Formatting and style properties. In order to apply formatting styles as well as insert elements such as images, multimedia files and links, a set of graphical items is shown before the edit box. Visually each item can be selected and clicked by mouse while the edit cursor is on the right point in the edit field. When the same property has to be applied via keyboard, the focus is not available for the graphical symbols. The screen reader Jaws is able to recognize each graphical icon due to the alternative descriptions, but it does not announce that the widget has indeed an associated JavaScript. A blind user is not able to select one of them via keyboard (i.e. through the Tab). Since for each graphical symbol a specific textual code is assigned, a possible solution is to learn all the corresponding textual coding (e.g., for bold effect the text must be enclosed between triple apostrophes or for italic in double apostrophes). This approach is not simple for a

beginner user. Furthermore, an additional effort is required by a blind user compared to a sighted person.

- Selecting special characters and symbols. To insert a special character or symbol, a combobox is available to the user for selecting a set and the corresponding characters are shown as a list of links. For example for the Latin char set more than 150 links are available. Visually, it is quite easy to select one by using the mouse. Unfortunately this is not so when using a screen reader. For a blind user who has to read them sequentially -- via Tab key or by listing all the available links using a screen reader special command ('Insert+F7' with Jaws) -- it is not at all easy or simple. A more close-packed structure listing all symbols should be used, for instance a second combo-box (Luzzi et al. 2008). In addition, Jaws does not correctly interpret text associated with uncommon symbols or characters. A more descriptive text should be applied (e.g. 'e' with acute accent).
- Focus issue. In the WEP the focus is managed via JavaScript: when one or more words in the text area are selected, all related parameters (including the focus) are stored by the script in order to apply the formatting correctly. However, when interacting via screen reader a blind user may not correctly understand how the focus is processed since the screen reader provides a "virtual focus", and this may not coincide with the system focus. This problem could be quite important since to format a portion of text in the original WEP, the user must switch between editing and navigation modalities several times.

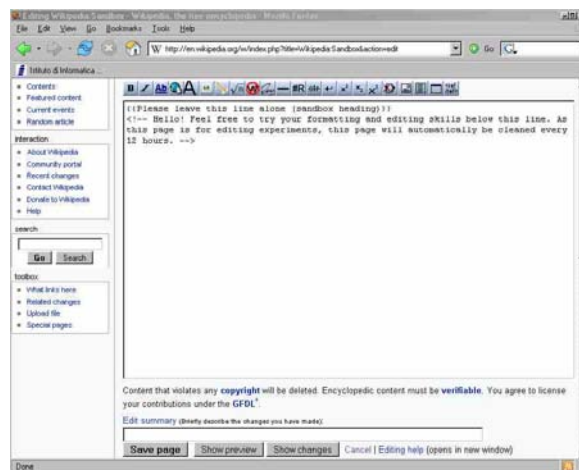


Figure 2- Wikipedia Editing page

Editing Wikipedia:Sandbox  
 From Wikipedia, the free encyclopedia  
 [...]  
**Graphic** Bold text  
**Graphic** Italic text  
**Graphic** Internal link  
**Graphic** External link (remember http:// prefix)  
 [... other graphical functions...]  
**Edit**  
 {{Please leave this line alone (sandbox heading)}}  
 <!-- Hello! Feel free to try your formatting and editing skills below  
 this line. As this page is for editing experiments.... -->  
**Link** Edit summary  
 (Briefly describe the changes you have made):  
**Edit**  
 Save your changes **Alt+s button**  
 Preview your changes; please use this before saving. **Alt+p button**  
 [...other buttons and text...]  
 Insert:  
**Link** –  
**Link** —  
**Link** ...  
**Link** °  
**Link** ~  
**Link** ?  
**Link** =  
 [...]

Figure 3 - Wikipedia Editing page, as read by JAWS

### 3. Redesigning Wikipedia Editing Page

To overcome the difficulties described in the previous sections, we have redesigned the Wikipedia Editing Page (WEP) by using the Accessible Rich Internet Applications Suite (WAI-ARIA). ARIA aims to make dynamic web content and applications more accessible to people with disabilities. ARIA adds semantic information that communicates the object role (e.g., role = "button") to the screen reader. In this way a graphic icon can be recognized by the screen reader as a control element.

In specific we applied ARIA suite to redesign and improve the following issues:

1. **Formatting toolbar**  
In order to simplify interaction, we have defined the formatting toolbar, using the ARIA "toolbar" and "button" roles. The `activedescendant` attribute makes the toolbar navigable via arrow keys. Once the toolbar receives the focus via Tab key, the child elements -- i.e. each widget -- can be accessed by up and down arrows, and can be activated by pressing the ENTER key, which applies the associated formatting function (e.g. Bold, Italics, etc.).
2. **Special characters and symbols**  
In the new UI we aggregate all characters of each alphabet in a second combobox located close to the alphabet combobox. Users first choose a 'language' and then select the desired character of that language. This compact solution is faster for the blind since when navigating the combobox with arrow keys, the screen reader announces the character name directly while in the original WEP every character read is preceded by the word 'link'. In addition when a user is in exploration modality, (s)he can skip/exit the combobox pressing a tab key once, while in the original WEP it is necessary to cross/visit all the links. To simplify selection of a special character, we also specified a clear label attribute for each `<option>` item of the second combo-box, so the screen reader can announce a description of the selected character.
3. **Focus**  
The focus problem is partially resolved by our new WEP. With the Jaws English version 9, the new interface allows users to insert and edit text without having to switch to navigation modality in order to find the active elements (widgets and comboboxes). The user activates the Editing modality and it remains for the entire editing/formatting process, reducing the number of steps needed to complete the whole task. Instead with the Jaws Italian version 9 the focus is in the correct position but Jaws loses the editing modality. The ARIA active descendant attribute (associated with the toolbar) allowed us to exploit the Wikipedia Javascript, which in the original UI was activated by the mouse click. Once the keypress event of a formatting button is captured, this Javascript applies the related function and moves the focus back to the text box.

### 4. Usability Test

In order to evaluate the new Wikipedia Editing interface developed applying our proposed solution, we conducted a user test with a group of blind people. Specifically, our evaluation aims to answer the following questions: (1) Is the editing/formatting effectively simplified? (2) Does the user perceive the editing/formatting task more quickly? (3) Is the presentation of interface elements clearer (combobox, labels)? (4) Which UI changes (i.e., ARIA toolbar or comboboxes) are more valuable for users?

The sample comprised 5 women and 10 men, age ranging from 18 to more than 75 years (only 1 person).

For the test, We developed an environment that reproduced the prototype of both Wikipedia user interfaces, i.e. the original and the new proposed WEP. In order to make the test for the users more comfortable, we conducted a remote usability testing. A test description was sent to each participant in electronic format by e-mail. The test is accessible via web. The protocol included a preliminary questionnaire, a set of tasks, and a post-test questionnaire:

- 1) In the preliminary questionnaire, participants provided information about their technical expertise, age, and knowledge of Wikipedia as well as of screen readers.
- 2) The remote testing procedure involved two simple tasks: (1) applying a formatting style, and (2) inserting a special character, to be completed on both the original and modified Wikipedia

interfaces. We decided to perform a remote test in order to allow users to use their own computers and assistive technologies. The environment for executing the search tasks was available online at a specific URL and contained only a text box for the login (password was not required) and two buttons: one to the user interface reproducing the original Wikipedia Editing Page and the other to our Modified one.

3) The post-test questionnaire consisted of 16 questions divided into three sections: information regarding the subject's experience performing the assigned tasks, difficulties in carrying out the task, and degree of satisfaction.

Preliminary data concerning test results of 15 totally blind users revealed that most users appreciated the simplified interaction; in particular 87% of users declare that applying a formatting style is more rapid in the modified UI (13% believe the 2 UIs are equivalent), and 73% declare that selecting of a special character is faster in the modified UI (20% users believe the two UIs are equivalent and for 7% original one is more rapid).

Concerning task performance, 80% of the sample completed the test in the modified UI respect to 47% on the original one; correctness of test results also improved: 33% for modified UI and 13% in the original one. Average execution time was decreased by 25% (from 7.00 min in the original UI to 5.25 min for the new one).

## 5. Conclusions

In this paper we analyzed various accessibility and usability issues that Wikipedia presents for blind users. Our analysis highlighted that although Wikipedia contents are basically accessible via screen reader, usability should be improved in order to facilitate interaction by the blind. Critical issues are mainly related to interaction with the Editing Page, currently very difficult for the blind. To overcome those problems when interacting via screen reader, we proposed a new Wikipedia Editing Page redesigned by applying ARIA suite. The user testing we conducted to evaluate our solution revealed positive results.

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