Is Wikipedia Usable for the Blind?

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ABSTRACT

Today wikis are becoming increasingly widespread, and offer great benefits in a variety of collaborative environments. Therefore, 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, and offers some suggestions for improving usability.

Categories and Subject Descriptors

H.5.2 [**Information Interfaces and Presentation**]: User Interfaces – *Graphical user interfaces (GUI).* K.4.2 [**Social Issues**]: Assistive technologies for persons with disabilities.

General Terms

Design, Human Factors.

Keywords

Wiki, elearning, accessibility, usability, blind.

1. INTRODUCTION

A wiki is software that allows users to create, edit, and link web pages easily, in a collaborative way. The father of wiki, Ward Cunningham, developed the first wiki (the software WikiWikiWeb) in 1994. This SW was available under the GNU GPL licence; thus a great number of wiki "clones", written in a variety of programming languages and using a vast range of databases, were soon available. Wiki-based websites are often referred to as wikis and this term recently entered the Oxford English Online Dictionary [12].

Wikipedia is one of the best known wikis. 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 [12]. This example highlights the most interesting features of wiki SW:

1) Collaborative environment shares the burden of pages/data creation among multiple users

2) Knowledge Management that allows a step-by-step refinement of contents, until arriving at a stable version representing a collective shared knowledge

3) Simplicity of use allows the potential participation of anyone in the creation of contents

In recent years Wikis have acquired astonishing popularity as collaboration tools in various areas, including eLearning. As on-line learning continues to grow at an exponential rate, wiki systems are increasingly used as educational tools and/or integrated in learning management systems such as Moodle.

The effectiveness of Wiki-based systems as learning tools is confirmed by various studies. Soo-Hwan et al. [9] found that learning programming is more effective in the community setting than in a content-centered setting, and collaborative learning via Wikis is more valuable when learning requires diverse problem-solving skills or the process of elaborating knowledge.

Bower et al. [3], by analyzing the use of two wikis in two Masters in IT, have verified that these collaborative tools can facilitate multi-user asynchronous creation, editing and restructuring of information. However, the design and implementation of wiki-based learning tasks can greatly affect their success, thus authors recommend a set of 12 principles for improving their effectiveness. For instance, these authors observed that tasks requiring a single product produce a wiki containing more integrated contents. This is the case of Wikipedia, where each encyclopedia entry requires contributions by multiple authors that are then integrated into a single description.

In order to remedy the lack of interaction noted in online discussion groups, and stimulate the collaborative environment, Augar et al. [1] adapted a traditional icebreaker exercise used in classrooms for use on a wiki, with good results: in the two-week exercise, the number of pages of the wiki increased steadily each day [1].

Furthermore, in the medical environment the use of wikis (with additional specific plug-ins) in wireless networks provides radiologists with efficient and time-saving methods for creating their teaching files and creating better communication tools for education, diagnostic radiology conferences or consultations. Wiki allows reliable management of heavy diagnostic image data, providing high scalability and ease of use for collaborative works [8].

Wikis are a great opportunity for visually-disabled people, provided the interactive system and contents are properly designed and delivered. Interacting with a wiki system is more complicated for a blind user since interaction requires the aid of assistive technology, which adds a level of complexity. However, blind and low-vision students encounter very different types of

obstacles, depending on the type of user impairment and the assistive technology used. The blind mainly use screen readers, while low-vision users, thanks to optical aids and/or specific customization options, may access a much wider variety of software applications, often including those with graphic interfaces [2].

At present, Wiki systems present limitations on collaboratively enriching media contents with additional information. Ferretti et al. argue that to really take advantage of the strength of the collective intelligence and to maximize cooperation among users, new solutions are needed for the creation, management and presentation of rich media content [5]. To this end, they developed a wiki-like interface that allows users to enrich multimedia learning objects - i.e. SMIL-based video lectures, with additional textual information, such as captioning, annotations and comments. Based on user profiles and technical characteristics of the interaction device, the student receives the learning objects in the most appropriate format. Captioning is crucial for the deaf, and also improves usability for foreigners. A mobile user receives a specific version of the lecture that fits the screen size. For a blind user the video lecture is translated into an XHTML document, and all the didactic material is presented as a linear sequence, thus reducing cognitive overload. In general, the additional contents may help any student to better understand the lecture.

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 short discussion followed by 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 [1].

2.1   Evaluation Methodology
To evaluate accessibility and usability of Wiki systems via screen reader, we selected a very popular Wiki: the Wikipedia portal (http://www.Wikipedia.org/). Specifically we analyzed three kinds of pages: (1) the home page, (2) the result of a search, and (3) the edit page and functions, by using the screen reader Jaws for Windows (http://www.freedomscientific.com) v. 8.0. We used both the MS IE version 6.0.29 and the Mozilla Firefox version 2.0.0.12 browsers.

The test was carried out by both authors independently; afterwards, outcomes were compared and integrated. One author has been totally blind since childhood and uses the JAWS screen reader every day; thus she knows this tool's functions very well and is able to use advanced commands. However, she considers the graphical interaction with Wikipedia to be difficult when using a screen reader. In addition, by analyzing the test results we noticed that her mental model of the editing page does not match the real layout exactly. This paper's sighted author carried out the test using only JAWS basic commands, but knowledge of the exact structure of the Wikipedia UI allowed her to rapidly understand the origin of obstacles encountered when interacting via screen reader. Therefore, integrating both these outcomes led to a more accurate analysis. The different experiences of the two authors when using JAWS allowed us to cover a variety of interaction modalities: i.e. both basic commands, which simulate the use of beginner users, and advanced screen reader functions.

Wikipedia is available in many languages. The Encyclopedia is composed of different numbers of articles according to the language. We tested both the English and Italian pages in order to understand whether language-based versions have the same or very similar user interfaces.

2.2   Home page
As mentioned, we tested both the English (http://en.Wikipedia.org/wiki/Main_Page) and the Italian (http://it.Wikipedia.org/wiki/Pagina_principale) home pages (Figure 1 and Figure 2).
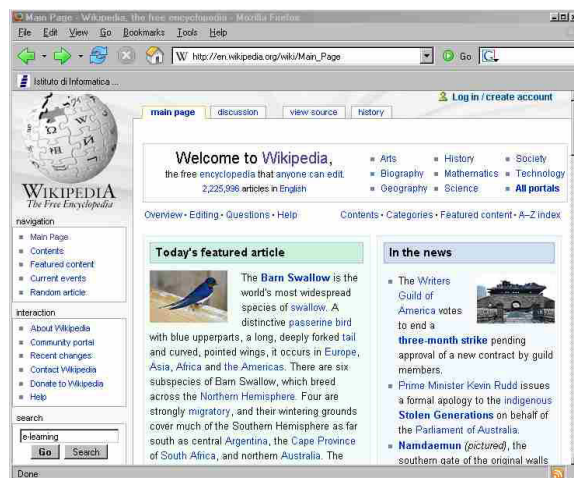

Figure 1 – Home page of Wikipedia: English version

Figure 2 – Home page of Wikipedia: Italian version

In the following, main accessibility and usability problems observed for both versions are reported.

- The first problem concerns links. JAWS provides the list of all links in the page. 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.

  - In the tested UIs several graphical links do not have any alternative description. For instance, in the Italian version, a great number of links are recognized with "ed/Pix" by JAWS in the list of all available links (see Figure 4); all these links point to the same resource, i.e. the image of one pixel, available at the URL http://upload.wikimedia.org/wikipedia/it/e/ed/Pix.gif. These links, used for the graphical layout, are perceived via screen reader and make the reading confusing and navigation more difficult, thus we suggest removing all them.

  - Others non-textual links without alternative descriptions or with alt="" (empty) are present in both versions, such as:
    "Cquote1.png/12px-Cquote1" in Figure 4 (it version)
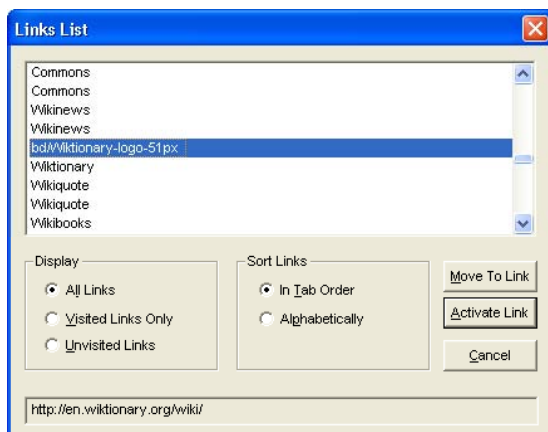   "bd/Wiktionary-logo-51px" in Figure 3 (en version)

Figure 3 – Wikipedia English version: List of links found by JAWS
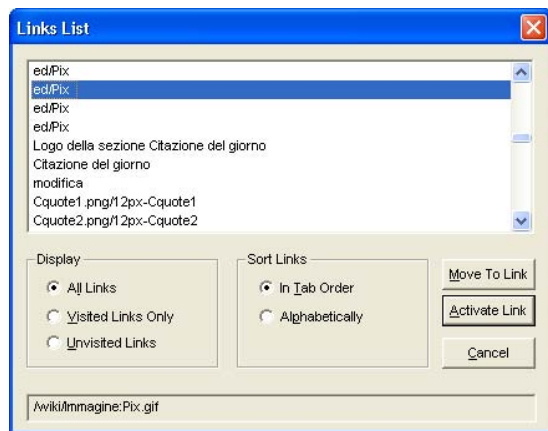

Figure 4 – Wikipedia Italian version: list of links found by JAWS

- Links labeled with confusing or meaningless names. Links such as "questo link" (i.e. this link) in the Italian version, and

"more..." in the English one, do not give the user any clue for understanding the function of the link itself, thus the user must explore the surrounding test via the arrow key or follow the link in order to understand its meaning. This is time-consuming. For this reason, the links should be self-explicative and not depend on the context.

- Number of links. The page contains too many links, i.e. over 350 links in the Italian version, and over 300 in the English one. A more appropriate number of links available in a single Web page should be considered (as suggested in [7]).

- Search edit fields. The Italian version has two search edit boxes, while the English page has only one. In both cases, the search edit fields are not labelled, thus the user needs to understand the purpose of the edit box from the context as well as from the search button labels. However 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 as showed in Figure 5. 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") Figure 6. Thus with FireFox the user is unable to understand the type of search since the difference between "Go" and "Search" is not clear, while it is possible when using IE. Obviously this depends on the specific implementations of JAWS and the browser version.
  However assigning clearer labels to the push buttons (for instance "Wiki entry" and "Search") would be useful for everyone. We also suggest assigning a label to the edit field. For instance a label "insert one or more keywords" could be added either as a hidden label or by using the "title" attribute, as Google did.

In Figure 5, Figure 6, and Figure 10 Bold text refers to words/sentences inserted by the screen reader, informing the user about interface elements (link, button, edit field, heading level and so on).
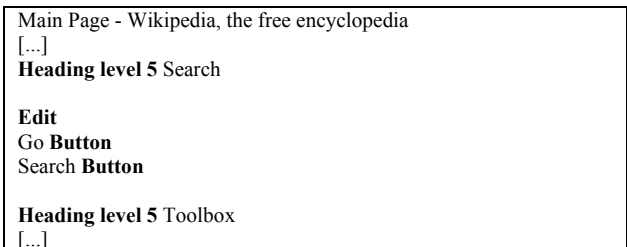
Main Page - Wikipedia, the free encyclopedia
[...]
Heading level 5 Search

Edit
Go **Button**
Search **Button**

Heading level 5 Toolbox
[...]

Figure 5 – Portion of text announced by JAWS using FireFox

Main Page - Wikipedia, the free encyclopedia
[...]
Heading level 5 Search

Edit
Go to a page with this exact name if one exists **Button**
Search the wiki for this text **Button**
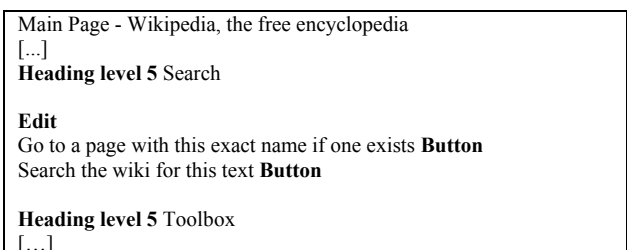
Heading level 5 Toolbox
[…]

Figure 6 – Portion of text read by JAWS using IE

- Content sections. The page contains various areas with different topics. In the visual rendering, each area or topic is

surrounded by a coloured box. In the Italian version, <mark>too few meaningful heading levels have been used to split and to mark each section.</mark> A sequential reading via screen reader is necessary for a blind user in order to explore all the content. In the English page, more headings have been applied. In general, in order to facilitate the page overview via screen reader, heading levels and hidden labels should be applied (see [6] and [7]).

- 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).

- Tables. Although div blocks are used, the graphical layout is based on tables. This is criticized by accessibility guidelines and formatting should be applied by CSS, with appropriate div blocks.

In this initial phase of our research, we aimed at to highlight the main problems of interaction via screen reader. Minor usability problems were not highlighted.

For instance, the announcement of horizontal lists of links separated by points in the main page (Figure 1) is rather boring when a screen reader is used. To obtain the same visual effect, it is possible to use CSS properties. To visually render a separating character between links, a border property available in the CSS features can be applied. The visual result is the same, but the screen reader does not intercept it, so the reading is less annoying.

2.3   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.

The Italian version is different -- an additional edit box is available only for the "Go to a page with this exact name if one exists" search function. However, in both cases, no label has been used for the edit field(s). To improve usability a clear label (such as a hidden label) should be assigned to the search edit field(s).

If the search succeeded, the first line read by the screen reader contains the keywords. For example, if the search word is "eLearning", the first line is "Electronic learning From Wikipedia, the free encyclopedia". On the contrary, <mark>when no result is found,</mark> the first line perceived in the page is "Search From Wikipedia, the free encyclopedia". In the latter case <mark>the result message is not clear enough.</mark> Probably, after becoming experienced with Wikipedia after using it a few times, a blind user becomes familiar with the two kinds of messages. However, 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.

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 ([7] and [11]). Although Wikipedia applies heading levels - i.e. <h1>, <h2>, etc. - the

content used is not clear, in terms of accessibility via screen reader.

In the English version, all main content sections start with "[Edit]..." (Figure 7). 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 get 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 "[").
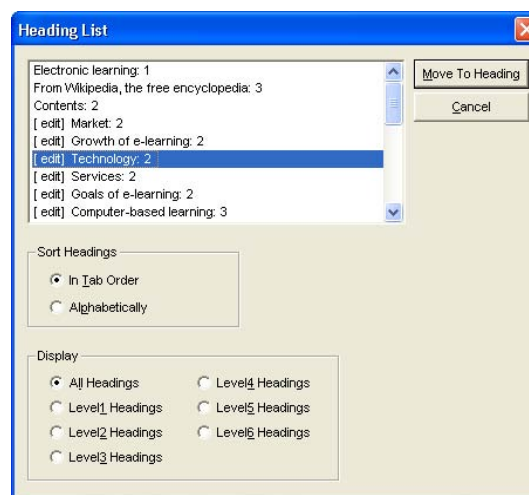

Figure 7 – Wikipedia English version: result of e-Learning search. List of headings levels provided by JAWS
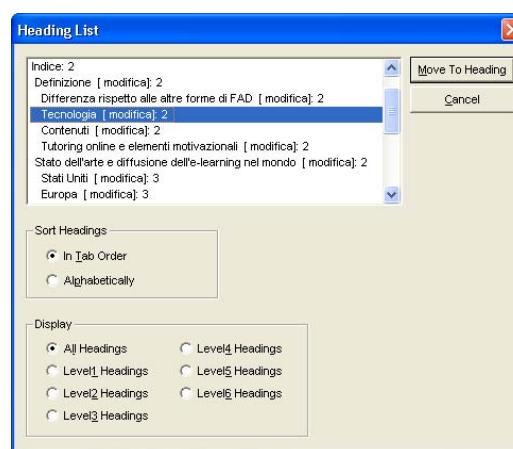

Figure 8- Wikipedia Italian version: result of e-Learning search. List of headings levels provided by JAWS

This does not occur in the Italian version (Figure 8). In this case the "[Edit]" -- i.e. "[Modifica]" (which is visually arranged under the title of the section) -- is read by Jaws at the end of the section title, thus the desired section should be picked out from the list by typing the first letter. To select the "Technology" section for example, in the English version it is necessary to move the focus by down-arrow key.

By looking at the Italian version in Figure 8, unfortunately the section "Technology" cannot be reached with the letter "t", as supposed, since the screen reader perceives this title as starting with three spaces. That is due to the specific HTML implementation (probably for improving visual rendering) and should be corrected.

2.4 Editing modality

The Editing modality is the most complicated UI in terms of usability via screen reader. Since the English and Italian versions are very similar, in the following we refer to the English one.

To evaluate the editing modality, we used the "Sandbox" tool made available by Wikipedia to carry out experiments, shown in Figure 9.
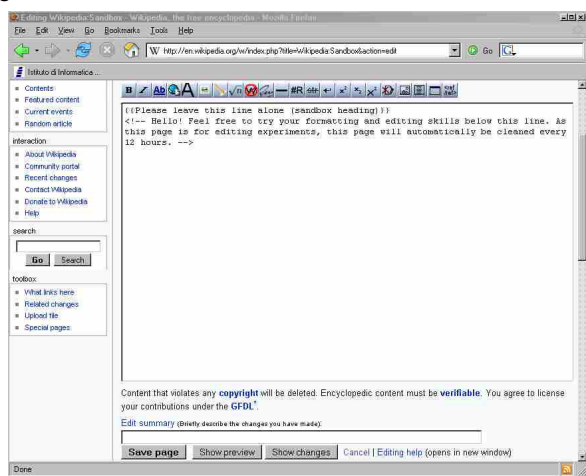

Figure 9- Wikipedia Editing page

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 list of graphical items is shown before the edit box. Graphically each item can be selected and clicked via 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 because alternative descriptions have been assigned. However, a blind user is not able to select one of them. Since for each graphical symbol a specific textual code is assigned, a possible solution is to learn all the corresponding textual coding. For example, 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 list of links is available to the user. Visually, it is rather easy to select one by using the mouse. Unfortunately this is not so when using a screen reader. In fact, that list is composed of over five hundred links. For a blind user who has to read them sequentially -- via Tab key or by listing all the available links through 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 combo-box or grouping sets of symbols.

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).

- No flexibility to switch between editing and selecting modality. Using both the mouse and the keyboard to point, select and edit allows the user to easily operate. A character, symbol or graphical style property can be selected via mouse, while typing the content via keyboard since visually it is easy to control and move the edit cursors. Unfortunately a blind person performs both activities via keyboard. This means an effective way should be provided to simply switch between the edit mode and selecting styles/functions. This activity should also be made easy via keyboard. For example, several intuitive shortcuts could be used to improve interaction (e.g., Ctrl+b for bold text, Ctrl+I for italic, Ctrl+k for links, and so on). However, in general these kinds of commands – i.e. editing functions and selecting properties from another set or page area – affect problems related to the focus control via screen reader and keyboard.

Editing Wikipedia:Sandbox
From Wikipedia, the free encyclopedia

You are not currently [...]
[...]
Graphic Bold text
Graphic Italic text
Graphic Internal link
Graphic External link (remember http:// prefix)
Graphic Level 2 headline
[... 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, this page will automatically be cleaned every 12 hours. -->

Content that violates any
Link copyright
 will be deleted...
Link Edit summary
(Briefly describe the changes you have made):
Edit
Save your changes [alt-s] **Alt+s button**
Preview your changes; please use this before saving. [alt-p] **Alt+p button**
[...other buttons and text...]

Insert:
Link –
Link —
Link …
Link °
Link ˜
Link ?
Link =
Link =
[...]

Figure 10- Wikipedia Editing page, as read by JAWS

3. BASIC SUGGESTIONS

Based on the preliminary testing and thus on the main difficulties observed in navigating through the search, result and editing functions, we suggest several elements that should be kept in mind when designing a Wiki interface. These suggestions also take into account the set of guidelines and criteria we previously proposed (in [6] and [7]).

Make it easy to identify the content parts. .
With Wikipedia, the home page is usually split into several areas (frames) according to different topics. For example, the English version of Wikipedia provides several boxes containing links to categories, search tools, the word of the day, and so on.

Each area should be clearly identifiable both visually and via screen reader. For the latter, structuring mechanisms should be used (e.g. heading levels to mark each topic area). The same modality should be applied to the result and content pages.

In some cases (e.g., in the content page) a linked summary to the main contents could make it easier to identify the content and navigate within it.

However, aside from the technical solution, it is important to provide a certain modality to allow the blind user to get a rapid overview of the main macro topics available on the page.

Make the search box clearly and quickly identifiable. .
Search edit field and buttons should be located at the beginning of the logical flow of the page content.

The search box should be easily identifiable (e.g., with clear labels and a colored area). Furthermore, its location early in the content flow should assure that the screen reader can identify that important main area almost immediately. In fact, the search function is one of the most important features of a portal like Wikipedia so it is essential to find it very easily.

In addition, clear labels should be used for edit field and search buttons in order to understand the specific kind of search process. (For instance, use "search pages with exact title", rather than simply "search text..."). The user should be able to quickly understand the search type he/she is about to carry out.

Moreover, if the search box is replicated in the same page (e.g., a search box on the top and a second one at the end) to facilitate the search task, one should use the same labels and terms to mark edit fields and buttons. This assures a terminological consistency on the page.

Keep the Editing function simple. .
The Editing function is very important in a Wiki system or, generally speaking, in any collaborative environment. Consequently the Editing commands as well as the Editing page should be easy for anyone to use independently from the interaction modality used. We offer several suggestions regarding the Editing function:

- Use a separate page for the Editing function.

- Put only the Editing fields, buttons and commands on the page. Do not place additional superfluous information and links on the Editing page.

- Provide a quick way to use formatting commands. To do this, in addition to clickable graphical symbols, provide an easy way to use the same function via keyboard. For instance, add a shortcut to each symbol, and/or provide an alternative modality such as a dropdown menu listing all formatting commands available.

- Provide an alternative textual input. An alternative textual input could facilitate formatting for skilled users. For instance, Wikipedia provides a special syntax to manually add formatting styles to the content (e.g. triple apostrophe for the bold style).

    To facilitate this modality two suggestions are (1) provide a help page listing all commands with their textual alternative input modalities (2) a very similar HTML syntax could also be allowed. This second modality would facilitate the input process for users who have experience with HTML language.

- Provide a simple way to insert special symbols. In the current version of Wikipedia, to insert a special character a set of over five hundred graphical links is available on the page. The authors offer two suggestions for improving such an operation: (1) clearer symbol description (2) provide a quicker, more compact way to select a special symbol.

    Since a great number of links makes interaction too difficult when using a screen reader, a more compact and effective way should be developed. A list on a separate Web page, or a compact combo-box containing descriptions of all available symbols is a possible solution for improving this process. For example, a more descriptive item such as "a with circumflex accent" is clearer than the character "a^" alone. In fact, just a symbol would not be readable by the screen reader; therefore, a descriptive text would overcome this inconvenience.

- Control the edit focus. As in the Editing procedure, the focus is very important and it is necessary to ensure that when interacting with formatting commands or choosing special symbols, the focus goes back to the editing cursor. This feature is fundamental to facilitating the Editing process when using a screen reader. Otherwise, the user risks losing the Editing position, rendering the composing process difficult or impossible for a blind person. Thus each Editing command, formatting process, or symbol selection should control the focus position as soon as the command or function has been carried out.

4. DISCUSSION

Collaborative environments offer a great opportunity for the visually-impaired if contents are delivered in suitable formats and interaction is supported in appropriate ways. Wikis are increasingly integrated into Learning Management Systems, to improve learning effectiveness in collaborative environments. Problem solving and shared knowledge building appear to be reinforced by student collaboration and cooperation.

E-learning and wiki environments should be friendly and easy to use for everyone, in order to eliminate any "technical barrier" and allow students to concentrate on contents, by reducing any possible negative effects on the learning process.

However research on usability of wikis is still in its infancy. Soo-Hwan et al. [9] observed that further study is needed on navigation and interfaces for effective use of wikis. Furthermore, a university-level survey by Carpenter et al. [4] revealed that only 20% of those interviewed believe that wikis are easy to use.

The WikiProject "Accessibility" is a project that aims to actively assist editors who have disabilities or other characteristics which inhibit their ability to contribute to the encyclopedia. The primary

focus is on improving the accessibility of articles for the differently-abled [13].

By analyzing the main functions of Wikipedia -- search, results and editing -- we verified that although all contents are accessible via screen reader, there are usability issues, mainly due to difficulty interacting with the interface. Blind users encounter the most difficulties when editing content. Thus, the main challenge for wikis and in general for LMS (Learning Management System) designers in general is providing simple and easy-to-use editing tools via keyboard and assistive technologies.

It is important to notice that wikis greatly simplify interaction for the sighted user since it masks users from the complexity of using (X)HTML languages, CSS, and other technological aspects, thus increasing the potential of building shared knowledge and participating in social activities. On the other hand, since wikis automatically translate wiki-syntax based contents in web pages, if both the layout and the translation SW are not opportunely designed with a deep knowledge of accessibility and usability issues, they may induce problems that may be propagated on each wiki page or entry. This shows the importance of considering usability issues from the beginning of the development of wikis and, in general, of any content or learning management system.

Making wikis suitable for the abilities and skills of all users offers many challenges. When defining the GUI it is fundamental to consider the needs of sighted users but the needs of the blind should also be taken into account when writing the UI code. Specifically, the same information should be provided through both visual and auditory channels, the design should be optimized for reading via screen reader, the UIs should be easy to use via keyboard and no additional cognitive effort should be required of the blind user.

As web 2.0 penetrates the Internet, new solutions are appearing that allow every individual to participate in social networking, regardless of his/her physical abilities. The Accessible Rich Internet Applications Suite (WAI-ARIA) aims to make dynamic web content and applications more accessible to people with disabilities. It mainly focuses on dynamic content and advanced user interface controls developed with Ajax, HTML, JavaScript, and related technologies [15]. With ARIA it is possible to mark regions and define sections of a web UI (such as menus, main content, sponsored links) and enable users to rapidly move among regions/sections via keyboard, instead of pressing the Tab key many times. For instance, in [10], in order to show the potential of this technology, authors built an accessible chat using the ARIA suite.

Building an editing interface that conforms to the W3C ARIA standard should overcome accessibility and usability problems, which prevent blind users from actively contributing to building Wikipedia contents.

5.   CONCLUSION

In this paper we analyzed various usability issues that Wikipedia presents for blind users.

Our analysis highlighted that although Wikipedia contents are accessible via screen reader, usability should be improved in order to facilitate interaction by the blind. Critical issues are related to updating the editing UIs, currently inaccessible for the blind. Therefore we have discussed some possible solutions to these problems.

In the future we plan to modify the Wikipedia editing UI by applying ARIA specifications. Afterwards, user testing will be carried out with blind users in order to effectively compare the original and ARIA-implemented Wikipedia UIs and evaluate the improvement, if any.

This paper may contribute to the Wikipedia Usability Project, which aims to make Wikipedia easier for everyone to use; additionally, our contribution aims to promote the application of standards relating to Web accessibility and usability.

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