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Making the Internet Accessible by People with Cognitive and Communication Impairments

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SUMMARY

This paper presents some of the work of the EU WWAAC project (World Wide Augmentative and Alternative Communication), which aims to make the electronic highway more accessible to people with cognitive and communication impairments, in particular those using symbols instead of text to communicate. Few specific guidelines are available to make sites truly accessible and usable for these user groups. We propose that guidelines are required for two purposes: to design standard Web pages for use by the general public, including a wide range of older people and people with disabilities, and also to design Web pages specifically for particular impairment groups, e.g. for symbol users in their personal, educational and employment activities. Not only should the guidelines be relevant to particular user groups, they must also be

- accessible—that Web developers can easily find the most relevant guidelines, and
- usable—that Web developers can easily put those guidelines into practice.

KEYWORDS: Guidelines, Internet, symbols, communication and cognitive impairments.

INTRODUCTION

People who have problems in using spoken and/or written language have special requirements both in communication and information retrieval tasks. For those with severe communication difficulties, the use of symbols is often their only medium of written communication in personal, educational and employment activities. The term symbol refers to graphic representations (for example, pictorial, iconic), other than the written word (See Figure 1 for examples).

Some individuals with language problems may also suffer from learning difficulties and for this reason may have problems making or comprehending complex

communications. The use of speech is also likely to be limited, and verbal utterances are likely to be supplemented by using gesture, facial expression and pointing. Comprehension of the spoken word is likely to be higher however, and for this reason listening to speech is often a preferred way of gaining access to information.

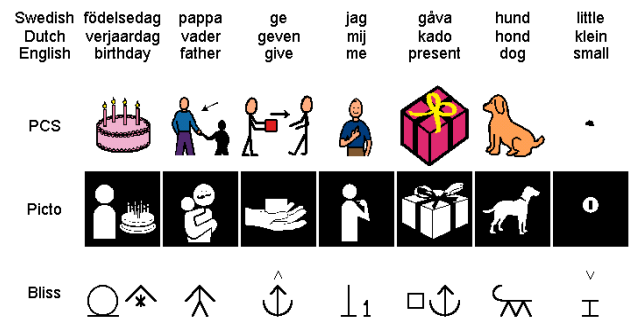


Figure 1. Six different ways to express the same sentence: “For my birthday, father will give (gave?) me a small dog”. Vertically, each single concept is represented in different languages (keywords) and in different symbol systems (PCS, Picto, Bliss). [5]

A substantial number of people with communication impairments may also have mobility limitations, and therefore need adaptations to allow them to access advanced communication aids and computer based systems either:

- directly, through a specialist keyboard or pointing device such as tracker ball or joystick or
- indirectly, through the use of virtual keyboards with scanning interfaces operated by one or more switches.

The worse case scenario is for an individual to have a combination of physical, cognitive and sensory difficulties, and this poses significant obstacles in allowing such individuals access both to the operational aspects and comprehension of text-based Internet services.

THE WWAAC PROJECT

The EU WWAAC (World Wide Augmentative and Alternative Communication) project, partially funded by the EU IST (Information Society Technologies) Programme, aims to make the electronic highway more accessible for a wide range of persons with communication and/or cognitive impairments. This will be accomplished by developing software which can make access to such services easier. In addition to developing accessible software, the project will also develop software to translate symbols into either text or other symbol sets. This will enable a person with communication impairments to use the World Wide Web, email and e-chat or discussion group facilities.

The project defined the primary end users of the WWAAC software to be people who use graphic symbol-based augmentative and alternative communication (AAC) systems rather than conventional means of communication. From this perspective the primary target group for the project are those with a congenital disability such as cerebral palsy who have problems with communication. However non-symbol users, such as people with learning difficulties or elderly people with communication problems following a stroke, could also benefit from the easier access to Internet services facilitated by the WWAAC project.

INCIDENCE OF INTERNET USAGE BY PEOPLE WITH COMMUNICATION IMPAIRMENTS

During the user requirements phase of the WWAAC project, [2] a sample of forty-two service providers (including professional facilitators, speech and language therapists, and teachers) indicated whether or not any of their AAC users were using Internet-based services (WWW, email, echat, or discussion groups). The majority of service providers (76%) reported that some of their clients were using such services, but extent of usage very much depended on the abilities of clients, availability of technology, and support either at school or at home. In reality only a small proportion of the more able clients were using such services, and even then needed considerable support from carers to access these services. Particular problems that their clients had when using Internet-based services included the following, all leading, in most cases, to an inability to use the services independently:

Time

Difficulties in reading and writing means that on a day-to-day basis users take more time to interact with the computer and to use applications requiring data entry, e.g. creating email messages. In addition time is needed to allow carers to set up any necessary adaptations, e.g.

switches and specialist software, to make access possible.

Expense

Owing to the slowness of users' interactions, long connection times on the Internet can be anticipated. This is in addition to the initial expense of special adaptations and software needed to facilitate access.

Physical Access

Physical access is one of the most significant barriers to computer usage and a lack of appropriate adaptations and software poses great difficulties for independent use of the Internet. The lack of integration between existing AAC aids and computers also adds significantly to these difficulties.

Lack of technical support

The requirement for technical support is high due to the specialist nature of AAC equipment and the hardware and software adaptations that are often needed to make access possible. Often such specialist IT support is not readily available, and more general IT support may also be limited, e.g. connecting computers to the Internet and e-mail services. Those who provide IT support require the necessary training with regard to the hardware and software being used and the adaptations required, as well as a clear understanding of Internet-based services.

Understanding WWW Content

Most Internet sites are predominantly text based, and, where literacy levels are low, users will have difficulties in understanding the content of such sites. Few sites are developed with the needs of such users in mind, either by providing simplified content or using symbols to augment text. Some users with language problems would also benefit from synthetic speech as an alternative or supplement to text, but currently speech output is not supported on conventional Internet browsers. Screen reading software is readily available, but has been developed with the needs of the visually impaired primarily in mind.

Learning to Operate Software

People with cognitive impairments may have particular problems learning how to use software, remembering instructions, and understanding how to navigate through a WWW page. If the user also has perceptual problems as well, then the task is made even more difficult.

These difficulties indicate a particular need for guidelines to facilitate Internet access and produce AAC-enabled Web pages for people with communication impairments. Producing such specific guidelines, along with a related Web-authoring tool, are some of the objectives of the WWAAC project. Although the main focus of the guidelines will be aimed at information providers developing sites specifically for AAC users, more

general guidelines will also be given to make all Web sites more accessible by these user groups.

ARE SUITABLE GUIDELINES AVAILABLE AND ACCESSIBLE?

In our search for existing guidelines which are relevant to the needs of people with communication and cognitive impairments, we have found relatively few sources that give specific recommendations for enhancing Web accessibility for people who do not use written text as their primary means of communication and instead rely on graphic-based symbols or verbal communication as alternatives.

It appears that greater energies have been directed at improving accessibility for those with visual impairments, such as ensuring that tables and complicated text can be accessed by a screen reader, and that text descriptions of images are always provided. In our investigation of available and accessible guidelines for particular target groups, we begin by looking at the guidelines for Web accessibility drafted by the W3C, and then at guidelines and Web sites developed specifically for people with communication impairments.

W3C-WAI GUIDELINES

'It is almost always possible to find out what is on a Web page if the disabled user has adapted and sophisticated equipment at hand and spends much time using it. But for Web information to become truly *usable* to disabled people, those drafting and editing Web pages need to follow a number of guidelines.' [4] The most significant initiative in this area is the work of the World Wide Web Consortium–Web Accessibility Initiative (W3C–WAI), which has drafted three main bodies of guidelines and advice for improving WWW accessibility:

- *Web Content Accessibility Guidelines (WCAG) 1.0* (www.w3c.org/TR/WAI-WEBCONTENT/)
- *The Authoring Tool Accessibility Guidelines* (www.w3.org/TR/ATAG10)
- *The User Agent Accessibility Guidelines* (www.w3.org/TR/UAAG10)

Each Guidelines document contains relevant Checkpoints and is followed by a list of all the Checkpoints at the end. Each is also linked to a separate document on more detailed Techniques to use to implement the guidelines. For example in the case of the WCAG, there are hypertext links to the Techniques documents as shown below:

Web Content Accessibility Guidelines 1.0
(www.w3c.org/TR/WAI-WEBCONTENT/)

links to

- *Techniques for Web Content Accessibility Guidelines*

(www.w3.org/TR/WAI-WEBCONTENT-TECHS/)

- *HTML Techniques for Web Content Accessibility Guidelines*

(www.w3.org/TR/WCAG10-HTML-TECHS/)

Whilst the Guidelines and Techniques are discrete documents, there is considerable overlap in content. This can make navigation through these documents difficult, also leading to some problems in finding information at a relevant level of detail. To overcome some of these difficulties, Colwell and Petrie [3] have suggested that the Guidelines, Checkpoints and Techniques be combined into one document, beginning with Checkpoints (least detail), followed by the Guidelines (more information) and finally by the Techniques (with detailed advice on implementation). Although this would involve a substantial amount of re-writing and re-ordering of the W3C material, this would lead to easier navigation and more usable guidelines.

In our search for guidelines relevant for people with cognitive and communication impairments, we are able to find within the W3C work detailed guidance for developing sites that facilitate access by the visually impaired and those using screen reading software. Guidelines also exist to facilitate access by people with physical impairments and to a lesser extent those with hearing impairments. However, there are few recommendations that are specific enough to make Web pages truly usable for those with communication difficulties and more specifically symbol users.

Some guidance for providing simplified WWW sites is given in the W3C document on Web Content Accessibility, covering both WWW site navigation (Guideline 13: Provide clear navigation mechanisms) and simplicity of content (Guideline 14: Ensure that documents are clear and simple), but the advice provided is somewhat limited.

On the other hand, 'guidelines are often by their very nature simplifications that must be general enough to be applicable to a wide range of products and technologies.' [1] And so, how can we ensure that all Web developers have a general overview of accessibility issues, while at the same time provide specific advice for designing Internet services for particular user groups?

The following sections are taken from the W3C document on Core Techniques at the following Web site: <http://www.w3.org/TR/2000/NOTE-WCAG10-CORE-TECHS-20001106/>

Comprehension

Checkpoints in this section:

14.1 Use the clearest and simplest language appropriate for a site's content. [Priority 1]

13.8 Place distinguishing information at the beginning of headings, paragraphs, lists, etc. [Priority 3]

14.2 Supplement text with graphic or auditory presentations where they will facilitate comprehension of the page. [Priority 3]

Such guidelines are simple enough but in practice can be difficult to follow. For example, following 14.1, what level of language skills should be considered as a minimum for developing WWW sites for access by people with communication difficulties, and, following 14.2, under what circumstances should auditory presentations be used?

To understand the design implications of many of the W3C recommendations also requires a detailed knowledge of HTML, and this raises an interesting question regarding the development of WWW pages and the skills that are necessary to develop accessible WWW sites. In order to make the most effective use of the W3C guidelines it is essential to have a good working knowledge of HTML and HTML extensions such as JavaScript. This can create some problems if those involved in the development of WWW sites are not IT professionals. Increasingly this is the case with WWW sites being developed by non-professionals using WYSIWYG editors such as PageMill, Homepage and Dreamweaver(<http://www.macromedia.com/software/dreamweaver/>). Professional quality WWW sites can be developed using Macromedia Dreamweaver 4, but without a detailed expert knowledge of HTML, code can still be generated that is less than perfect from an accessibility perspective and fails to follow W3C recommendations. Conformance testing tools such as Bobby (<http://www.cast.org/bobby/>) can assist in the process of improving such code, but without a detailed knowledge of HTML the errors generated are almost impossible to understand.

A recent development in Dreamweaver is the production of accessibility testing plug-ins, which automatically perform conformance tests on WWW sites being developed, but for the time being these tools cannot automatically repair code to make it more accessible and expert interpretation is therefore still needed.

IT experts might claim that WWW site developers must have the necessary skills in HTML in order to develop accessible sites, but this is missing the point to some extent. If the Internet is to become truly accessible to people with disabilities, then the development of WWW pages also needs to be made accessible to non-IT-specialists who have more interest in developing the applications than understanding the technology. For such users WWW site development tools are empowering,

and the challenge is to ensure that a detailed technical knowledge is not required in order to use them effectively.

In our research within the WWAAC project, we have found that more and more service providers are producing Web sites for and about people with communication impairments. In interviews we found that a number of Web sites had been developed by those organisations. Many of these Web sites are not fully accessible for their own target user groups, although there are indeed some examples of well developed sites.

For example, the Queensland University Aphasia Group has developed a WWW site that is specifically designed to be accessible by people who are aphasic and therefore have problems reading text. See http://www.shrs.uq.edu.au/cdaru/aphasiagroups/Web_Development_Guidelines.html. In addition the site lists a number of guidelines drawn from the W3C work, and extended by the site's developers. Many of these guidelines are also particularly relevant for other older people and symbol users, for example, the importance of limiting the amount of information presented on screen and avoiding brightly coloured backgrounds.

Special-information providers (such as social services, rehabilitation and special needs schools, care centres and homes for elderly people) would also benefit from specific guidelines to make their Web sites more accessible to their target audiences. Care is needed when developing general guidelines, however, to ensure that specific guidelines for one user group do not conflict with those for other user groups. For example, the guidelines for accommodating those with aphasia developed by Queensland University suggest that using borders can clearly delineate sections of text and graphics for people with reading problems. However, if borders or even tables are being proposed there is a potential conflict, since for people with visual impairments, a screen reader may well have problems due to the additional formatting they provide.

Providing general guidelines that cover all disability groups is unlikely to be successful as there will always be some potential for conflict. Currently accessibility guidelines primarily assume that text is the preferred medium of communication and that the transformation of images and spatially presented information such as frames and tables into text is therefore of a high priority. However as we have seen for other disability groups the image rather than text is the preferred medium of communication. Guidelines are therefore required to provide graphical and other forms of representation in place of written text, or to simplify and summarise text content to make it more accessible to a wider audience. Some developments in HTML may also be needed in order to facilitate this, and part of the brief of the WWAAC project

is to ensure that a dialogue takes place between the project and HTML standard work being carried out by the W3C.

We would argue that guidelines are required for 2 purposes:

- to design standard Web pages for use by the general public, including a wide range of older people and people with disabilities and
- to design Web pages specifically for particular impairment groups, e.g. for symbol users in their personal, educational and employment activities.

The W3C is targeting the former, but we also propose that guidelines for specific target groups be included as subsections to, or links from, the main body of W3C Web accessibility guidelines. We also propose that these guidelines consider the needs of the wide range of Web developers, including those who may not be experts in the use of HTML and who might be using WWW authoring tools.

The Queensland University Aphasia group extracted their relevant guidelines for a particular user group, making them more accessible and usable by service providers in this particular area. Likewise, the WWAAC project will extract and produce guidelines specifically for symbol users, but will also go one step further by developing a Web authoring tool to help Web developers to produce such AAC-enabled Web pages. So it is not just that the guidelines must be relevant to particular user groups, but that they must be:

- accessible—that Web developers can find the most relevant guidelines, and
- usable—that Web developers can easily put those guidelines into practice.

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