WWAAC Deliverable 12a - Guidelines for developing an AAC-enabled world wide web

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**Deliverable 12a: Guidelines for developing an AAC-enabled World Wide Web**

*(including updated Internal Deliverable i6 - Pre Draft Standards for Web-Based Information)*

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Executive Summary

This document, a final output of the WWAAC project’s Workpackage 7, focuses on guidelines for a World Wide Web that is more accessible by people with complex communication needs who use graphic symbol-based augmentative and alternative communication (AAC). The first stage of this activity was to develop an internal project resource, documenting requirements identified in the early phases of the WWAAC project and current work in the area of Web accessibility. This internal resource, originally prepared as internal deliverable i6, has now been updated and forms the first part of this document.

A framework for design guidelines is described using the Web Content Accessibility Guidelines (WCAG) version 1.0, and then concentrates on the working drafts of WCAG 2.0 in order to facilitate integration of WWAAC recommendations with current drafts and discussions. The particular characteristics of AAC users we are targeting are then described, followed by existing guidelines extracted from sources in the references, as well as from exemplars of good practice found in the Appendices. Existing guidelines cover the development of general-purpose sites, sites specifically for AAC users, and also adapted browsers for AAC users.

Before proposing success criteria, examples and strategies for specific guidelines in the WCAG, a number of issues were discussed with experts within and outside the consortium: whether to have one site for all or two alternative sites, the conflicting needs of users, simplicity of content, summaries of content, top loading, tagging images, navigation mechanisms, and search engines. Discussions on these issues have helped to form a basis for guideline development and have led to the following recommendations, with rationale based on the WWAAC project’s user requirements and evaluation work:

Recommendation 1: Provide a clear representational image on the site’s home page.

Recommendation 2: Alt tags should provide prime information for the user, and should distinguish between salient (most prominent) and non-salient content.

Recommendation 3: Provide simple page descriptions as metadata.

Recommendation 4: Add clear in-page link such as ‘Skip-to-content’ near the top of the page (as some Web developers already do).

Recommendation 5: Consider the number, location and focus of links on a page.

Recommendation 6: Provide a progressive complexity for both site and page content, so that people with different abilities may be able to obtain information from the same Web site.
Recommendation 7: Use static, rather than dynamic, content for critical parts of the Web site.

Recommendation 8:
Consider a change of priorities in the Web Content Accessibility Guidelines to reflect the findings of the Disability Rights Commission report (2004).

These recommendations are proposed as success criteria, examples and strategies to be included in the W3C Web Accessibility Initiative’s (WAI) draft Web Content Accessibility Guidelines (WCAG 2.0). Whilst these recommendations have been developed to make Web sites more usable and understandable for people with complex communication needs, other user groups who may be struggling due to age, disability or handicapping situations could also benefit.
Guidelines for Developing an AAC-enabled World Wide Web

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1. Introduction

This document, a final output of the WWAAC project’s Workpackage 7, focuses on guidelines for a World Wide Web that is more accessible by people with complex communication needs who use graphic symbol-based augmentative and alternative communication (AAC). The first stage of this activity was to develop an internal project resource, documenting requirements identified in the early phases of the WWAAC project and current work in the area of Web accessibility. This internal resource, originally prepared as an internal deliverable No. 6, has now been updated and forms the first part of this document.

Section 2 provides a framework for design guidelines, using the Web Content Accessibility Guidelines (WCAG) version 1.0, and then concentrating on the working drafts of WCAG 2.0 in order to facilitate integration of WWAAC recommendations with current drafts and discussions. Section 2 also describes the particular characteristics of AAC users we are targeting. The next 3 sections (Sections 3, 4 and 5) extract existing guidelines from sources in the references, as well as from exemplars of good practice found in the Appendices. Although many of the guidelines will overlap to a certain extent, they are grouped according to:

- coding (elements in the HTML, e.g. alt text, scripting, flash, frames, etc.)
- layout (elements of design, e.g., colour, size, page layout, navigation, etc.)

and also according to:

- physical/sensory issues (particularly relevant to access and navigation), and
- cognitive/linguistic issues (particularly relevant to information presentation and transformation).

Section 3 describes existing guidelines for the development of general-purpose sites, Section 4 describes guidelines for those developing sites specifically for AAC users, and Section 5 describes guidelines for those developing adapted browsers for AAC users. Section 6 then discusses issues in developing new guidelines, before proposing recommendations to the W3C Web Accessibility Initiative (WAI) in Section 7.

This document will be used as a basis for providing feedback to the W3C–WAI for its Web Content Accessibility Guidelines V2.0 currently existing in draft form (the version used in this document is dated 1 March 2004). Detailed comments have been provided on earlier drafts to the WAI, which were documented first as part of an additional internal deliverable No. 6a (Co-operation with W3C–WAI). Further co-operation with the W3C–WAI has been documented in Appendix 6, in particular with reference to the WWAAC project’s Concept Coding Framework. This activity is conducted in conjunction
The process of developing guidelines for an AAC-enabled World Wide Web began with the requirements capture phase of the WWAAC project, which included interviews with a variety of users, service providers and manufacturers of AAC equipment. This provided an opportunity to identify some of the requirements for developing AAC enabled WWW pages. An analysis of the WWAAC User Requirements Document (Clarke et al 2001) provides some insights into the likely needs for information on WWW design in this sector. The critical issues related to:

**Accessible software applications**
- Developing good screen reading software and support for speech output, tailored and appropriate for users of AAC, e.g. embedded control elements for speech synthesis software (also issue of different national languages being supported).
- Providing simplified WWW browsers (entering URLs in particular).
- Making plug-ins such as FLASH or Shockwave accessible (also applies to language extensions such as Javascript).
- Providing a good alternative to mouse/pointer input, i.e., keyboard access.
- Providing support for switch and other non-mouse users.
- Use of large buttons for on-screen controls.

**Layout**
- How to develop simple and uncluttered layouts for WWW pages.
- How to simplify and lay out text, grammar, etc., e.g. highlighting of key text.
- Supporting the visually impaired, e.g., large text and large, or customised, graphics.
- How to use animation appropriately.
- Guidance on size and appropriate use of images.
- Ensuring a non-reliance on images—also text-only versions of sites.
- Strategies for navigation—reminding users where they are and have been.

**Coding**
- Guidance on the use of symbols versus text.
- Automatic symbolising of keywords.
- Developing symbol vocabulary for WWW use.
- Marking keywords on sites clearly.
- Ensuring links are meaningful.

**General**
- Providing information on the design implications of different communication problems.
- Providing guidance for WWW designers in dealing with cognitive issues.

In summary, a variety of suggestions were given as to the types of services and developments that were needed:
1.1 Integrated Speech Output

The most common need identified was for good text to speech systems that would read email and WWW pages to those with communication problems. There was a perceived need for integrating speech output into such applications. This would also involve being able to control the speech output from within the application, i.e., having embedded control elements tailored and appropriate for users of AAC. For example, image navigation is not particularly important to AAC users, but highlighted boxes and their tailored presentation are.

1.2 Simplified Content

Recommendations were needed to ensure that short and simple text was used on WWW sites and that keywords were clearly identified. One suggestion was to have software that would check the complexity of any language used and automatically simplify it. Another suggestion was that software could be developed that would automatically symbolise keywords on a WWW site. It would need to be decided whether such keywords would be taken from the user’s own vocabulary or from a common list.

The issue of layout and use of graphics was seen as being important to address, particularly in relation to the size of images and the use of animation. Recommendations were also needed on the use of graphics on WWW sites, i.e., size of graphics, and also their dynamic aspect, i.e., avoiding excessive moving graphics and animation.

1.3 Accessibility of Language Extension and Plug Ins

Concerns were also raised about ensuring that WWW sites containing plug-ins such as FLASH or Shockwave were accessible to symbol users. Note—this same issue also applies to the accessibility of language extensions such as Javascript.

1.4 Improved Accessibility for Switch Users

Advice on making the Internet accessible to switch users was also seen as being needed, and in addition to the issues of physical and sensory access, cognitive issues were also raised, e.g. simplifying materials and providing navigational cues to users to assist them in using a site. Accessibility issues may arise from either the design of the Web site itself or from the design of the browser, and therefore any guidelines will need to make this distinction. Separate guidelines were needed for the design of WWW browsers and site content.

1.5 Improved Access for Symbol Users

A significant number of comments related to the development of WWW services for symbol users, the need to both develop more symbol-based sites, and to improve access to more general Web sites by symbol users. Speech output was one mechanism for achieving greater accessibility, but in addition there were a variety of other ways in which access could be improved. Simplified WWW browsers for symbol users would be particularly useful, also with an emphasis on limiting the need for entering WWW addresses. Such
software should also be accessible by switch users. Simplified search engines were also seen as being needed.

The work of the ALDICT project (Access for Persons with Learning Disability to Information and Communication Technologies) has made significant impact in this area. Its e-mail software Inter_Comm, enables symbol users to compose, send and receive email messages in his/her own symbol set and language, using Widgit’s software ‘Writing with Symbols’ (Freyhoff, 2001; Pereira, et al., 2003; [www.Widgit.co.uk](http://www.Widgit.co.uk)). Following on from ALDICT’s work, Widgit Software Ltd. has developed new software called Communicate Webwise. This software can process most Web pages, apart from complicated ones with Java or Flash components, as either symbols, plain text in any font size, or as spoken words. It is necessary to consider, however, whether symbol support for the entire page is needed or desired by end-users, or if a symbol-embellished summary of the Web page or site would be more appropriate. Mencap ([www.mencap.org.uk](http://www.mencap.org.uk)) suggest that some people find too many symbols on a page confusing, and that unless you know your readers prefer symbols above most words, it is better to use symbols just for key words or ideas. Allowing the user to choose is really the answer.

1.6 Developing Core Symbol Vocabularies

A core symbol vocabulary for WWW use was seen as being required, and guidance for WWW designers on how to use symbols versus text was seen as being necessary. It was also seen to be important to develop the resources that would be needed for symbol access, e.g. freely available symbols. A word of caution was expressed, however, as it was suggested that developers would need explicit training in the use of a particular symbol language in order to make effective use of those symbols on their WWW site. This raises an issue of whether it is reasonable to expect a WWW designer to be able to take these issues into account without expert support. Such expert support can, however, be offered to Web developers through the Web authoring tool under development in the WWAAC project.
2. A Framework for Design Guidelines

The W3C Web Content Accessibility Guidelines (WCAG 1.0) provides detailed recommendations for improving accessibility (W3C–WAI, 1999). As a starting point, Web sites should conform to the W3C at least to Priority level 1 in order to be accessible. Priority 1 specifies that a Web content developer must satisfy a particular checkpoint; otherwise, one or more groups will find it impossible to access information in the document. In contrast, Priority 2 specifies that the Web content developer should satisfy the checkpoint, and Priority 3 specifies that a Web content developer may address the checkpoint.

WCAG version 1 is used as the basis for this overview of existing guidelines. Written very much with the HTML coder in mind, unfortunately their on-line documents are not particularly easy to follow, as users are led to a number of documents with overlaps in content. It is easy to get lost in such documents and it can be difficult to find the relevant information needed. The most useful from a developer’s perspective is the document HTML Techniques for WCAG 1.0, as this also contains worked examples to show how the general principles are applied.

It is necessary, however, to look beyond version 1 to the Working Drafts of WCAG 2.0 (the version consulted for this document being dated 1 March 2004) and regularly being updated. WCAG 2.0 has been studied to determine where the WWAAC project can add detail that would be particularly relevant for AAC users (W3C–WAI, 2004). It is recognised that guidelines ought to be general enough to be applied to a wide range of emerging technologies; in fact, one of the improvements of WCAG 2.0 over Version 1.0 was to make it more easily applicable to a wide range of Web-based languages. WCAG 2.0 demonstrates how more general (less HTML-specific) WCAG might read, providing guidelines for 4 basic principles, with the goal to create Web content that will be perceivable, operable, understandable, and robust to work with current and future technologies. For each of these principles, non-technology-specific guidelines are provided, as well as success criteria (normative in nature) and also definitions, benefits and examples (all informative in nature). More detail is given in Appendix 1.

WCAG 2.0 is now starting to make headway in considering the needs of people with communication impairments, and although there is no detailed guidance for AAC users, we now see specific reference to the needs of AAC users. As proposed at a WAI/WWAAC meeting in June 2002, rather than providing totally new principles and guidelines, the WWAAC project aims to provide success criteria, examples, and strategies to make Web sites more accessible to our users. However, it must be remembered that although it is possible to have an accessible, legal and reliable Web site that meets the WAI recommendations, it may not necessarily be a good Web site. Good design will enable good access, but they are not identical. In fact, 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’ (Engelen, 2001). Therefore, Web developers need to apply best practice in usability into their Web sites, going beyond minimum adherence to best practice and policy, which will help to ensure quality and inclusiveness for all (Office of the E- envoy, 2003).

A recent study, investigating the extent to which the Web discriminates against disabled people, was completed for the Disability Rights Commission (DRC) in the UK by the Centre for Human-Computer Interaction at City University, London (Disability Rights Commission, 2004). The study included a survey of Web site owners and developers, focus groups and interviews with a User Panel of 50 people with disabilities, representing the following impairment groups: blind people using screen readers with synthetic speech or Braille output; partially sighted people who may be using screen magnification; people who are profoundly deaf or hard of hearing; people with learning difficulties such as dyslexia; and people with physical impairments in their arms, hands and fingers. The study included automated accessibility evaluation of 1000 Web site home pages, and both automated and user-based evaluation of 100 complete Web sites.

The study demonstrated that most Web sites are inaccessible to many disabled people and fail to meet the most basic standards set by the W3C. Specifically, it found that violations of just 8 Checkpoints of WCAG 1.0 accounted for 82% of the problems users reported which were covered by the Checkpoints, and 45% of the total number of problems reported by the users. It is interesting to note that 5 of these 8 Checkpoints were not classified by WCAG as Priority 1, and therefore a site could still have Priority 1 conformance. It is also significant that the majority of these most important Checkpoints are qualitative, emphasising that many of the problems can only be found and then resolved by direct involvement of people with disabilities in the design and evaluation of Web sites. Based upon the most common types of Web accessibility problems experienced by a wide range of users, the DRC report makes recommendations to ensure that disabled people can enjoy full access to, and use of, the Web. A selection of the DRC recommendations for better coverage or special emphasis in the WCAG, relevant to the issues discussed in this document, are given below:

- Reduce the number of links and ensure that genuine and necessary links are clearly identified as such
- Improve search design
- Eradicate excessively deep site structures
- Divide blocks of information into more manageable units
- Ensure that foreground and background colours have sufficient contrast
• Use the clearest and simplest language appropriate for the site’s content

• Avoid movement in pages until they can be frozen.

These recommendations should be considered by the WCAG Working Group, and may affect future drafts of the accessibility guidelines, including more effective links between the guidelines and the techniques to implement those guidelines. They may also impact upon the 10 most important guidelines found on the ‘credit card summary’ of WCAG 1.0 guidelines (www.w3.org/WAI/References/QuickTips and Appendix 1, section 4.)

From all of the above, it is clear that there is a need to refine guidelines for the development of general purpose WWW sites to take the needs of those with communication difficulties into account, which should also make Web sites easier to use for other user groups. However, access to more general sites may not always be feasible or desirable for users with severe disabilities, and so there is also a need to develop guidelines targeted at more specific disability groups with more specific needs.

The primary target population of end users defined by the project are people between the ages of 12 and 25 years who use graphic symbol-based AAC in face-to-face interaction, and who are professionally supported in their use of AAC and the Internet within school/college or receiving non-professional support at home. The early phases of the project provided an opportunity to identify some of the characteristics of the different AAC users, who could include:

1) Young adults with congenital disorders leading to problems with communication. This group could manifest a range of problems in accessing WWW pages, all of whom could have easier access to the Internet through better design and accessibility features. These users’ particular difficulties could include:

a) Problems with fine movement and co-ordination. Most of these difficulties can be overcome as long as keyboard access, rather than usage of the mouse as input, is available in the browser or the site. Those with less severe problems could then access the sites with keyboard or alternative keyboards. Severe difficulties would require alternative access with scanning style interfaces using a limited number of specialist input switches. Facilitating access by a range of AAC devices would be critical for these users.

b) Problems with vision. Visual accommodation might be poor for some users requiring large character displays. It was not anticipated that significant numbers would have no usable sight however.

c) Problems with comprehension of on-screen text. This would mean that simplified text presentation would be needed, or interfaces with a primarily image-based content. Another option would be to support
aural presentation of existing WWW content using screen reading software through the use of Alternative Sound or Speech Tags, similar to ALT Text tags currently in use for describing images. In fact, in order to meet the needs of a wide range of users, the permutations could be wide ranging. Web content in whatever form (text, images, sound, speech, symbols, concepts) could be translated to a more usable form for the user through the use of appropriate Tags, including Alt Text, Alt Symbols, Alt Images, Alt Sound, Alt Speech, or even Alt Concepts:

```
     Web Content
      /    \
     /     \n   Text   Symbols
        /     \n   Images  Sound
          /     \n   Speech  Concepts
```

d) Limited expressive ability, using symbols or other non-text forms of communication. Some of these users may be using limited numbers of symbols, whilst others may have a more extensive symbol vocabulary (1000 words +), and therefore likely to be relatively competent in terms of communication skills. It should be noted that even those who have limited expressive abilities (and cognitive skills within a normal range) can be expected to learn relatively complex operating procedures for using an adapted Web browser and retrieving information from Websites. Expressive use of symbols would be more relevant in interactive Web-based tasks, such as e-shopping, and this should be further developed in the WWAAC software.

e) Limited expressive ability and in addition having learning difficulties. It is for this group that the added value of summaries and language simplification become so important and overlaps with other end user groups, such as pupils or adults with learning difficulties.

2) Adults and elderly people with acquired communication disorders brought on by accident or stroke. Aphasia would be the most common problem, making the reading of on-screen text difficult. Whilst other disabilities might also be present, this group would be characterised by having fairly limited and specific disabilities in relation to text usage, and could therefore benefit considerably from simplified WWW sites and synthetic speech output.

Whilst many of the requirements for these groups of potential users are similar, there are also some potential conflicts in requirements making one optimal design for all potential users impossible. For example, some symbol users clearly have very different needs from the other groups in relation to translation and presentation of information in a visual form. In addition, those with specific acquired disabilities will differ considerably from those with congenital disorders who are probably also more likely to have multiple
disabilities. There will also be a worse case scenario for each category of user where Web accessibility will not be considered relevant; however, the project can still aim for optimal accessibility for a greater number of people.

A significant number of guidelines for general accessibility exist and cover visual impairment and motor impairment in some depth. Ensuring accessibility by specialist AAC devices needs more work, but has been addressed to some extent in existing literature. Likewise, guidance for developing synthetic speech reading of WWW sites could also be extended to support those with communication difficulties rather than assuming screen readers are only being used to support those with visual impairment. Furthermore, support for people with communication difficulties can learn from the needs of people from other user groups, e.g., people with learning disabilities such as dyslexia, who are likely to have reading difficulties and poor short-term memory. Therefore, guidance for designing content to help overcome some of these difficulties is also included in this document as relevant to our users.

Users in the WWAAC project have all or any of physical, sensory, cognitive and linguistic difficulties and it is difficult to separate specific guidelines for specific areas of difficulty. However, the separation can serve to emphasise a particular focus, even though the guidelines will overlap to a certain extent. In terms of physical and sensory issues, it is clear that the needs of those with visual impairments are covered well by the W3C–WAI. It is necessary to consider the needs of switch users as the most extreme case, and these have also been covered to some extent by the WAI. In terms of cognitive issues, WCAG 2.0 is making greater progress, but more work is needed in many areas, for example, with regard to reducing the complexity of the content and providing advice for text summaries. Closely linked to cognitive issues are linguistic issues, and in fact the separation of the two may be a false one. Here it is necessary to consider the needs of non-reading symbol users as the most extreme case. Therefore, text summaries and keyword symbol transformation are particularly important. It must be stressed, however, that symbol support could also be provided to facilitate Web access for a range of other users, including for example, people with aphasia, people with learning difficulties, and elderly, novice users of the Internet.

Therefore, from the perspective of the WWAAC project and its intended user base, the critical dimensions to consider, and refine where appropriate, in the development of WWW design guidelines are (these dimensions have been revised since the first version of Internal Deliverable i6, following discussions within the consortium):

Guidelines for the development of general-purpose sites

a) General issues
   - Coding guidelines
   - Layout guidelines
b) Physical and sensory issues (access and navigation)
   - Coding guidelines
   - Layout guidelines

c) Cognitive and linguistic issues (information presentation and transformation)
   - Coding guidelines
   - Layout guidelines

Guidelines for those developing sites specifically for AAC users

a) Physical and sensory issues (access and navigation)
   - Coding guidelines
   - Layout guidelines

b) Cognitive and linguistic issues (information presentation and transformation)
   - Coding guidelines
   - Layout guidelines

Guidelines for those developing adapted browsers for AAC users

a) Physical and sensory issues (access and navigation)
   - Coding guidelines
   - Layout guidelines

b) Cognitive and linguistic issues (information presentation and transformation)
   - Coding guidelines
   - Layout guidelines

Recommendations for accessible design can be described as either relevant to coding (elements in the HTML, e.g. alt text, scripting, flash, frames, etc.) or layout (elements of design, e.g. colour, size, page layout, navigation, etc.), and the guidelines have been grouped accordingly. Please note that the guidelines described below and the needs of specific user groups will overlap, either between guidelines for Web pages/Browsers or guidelines relevant to Coding/Layout. If there is such overlap, the guideline has been repeated under each heading. The categories are meant simply to illustrate, with key examples, the focus that such guidelines can take, as well as to help identify gaps in existing guidelines where further research questions may need to be answered now or in the future. In addition, the categories can serve as a conformance checklist for the WWAAC software, as well as for the WAI in
ensuring that the needs of a wider range of users are specifically included in the Web Content Accessibility Guidelines.

It should be appreciated that the Internet is an emerging technology and specific guidelines will therefore change as the technology develops. Since WCAG 2.0 aims to make itself more easily applicable to a wide range of Web-based languages, emphasis will therefore not be placed on making a statement on the preferred technology for developing Web pages. However, the guidelines from WCAG 1.0 listed in this document relate specifically to HTML 4.1, rather than XHTML, as HTML is still the most common mark-up language for WWW sites. In the future, it may be that these guidelines will either need to be refined and revised to take into account the differences between HTML and XHTML, or they will need to be revised to those in WCAG 2.0 as this further develops from its working draft status.

The following guidelines have been extracted from the sources listed in the references section, and also extrapolated from the exemplars of good design described in Appendix 1. Comments have been provided where there is a particular need for further investigation or to refine or extend existing guidelines, some of which will be picked up within this Deliverable in making more specific recommendations to the WAI.
3. Guidelines for the development of general-purpose sites

Many of the general guidelines that the W3C have documented for improving the accessibility of WWW sites are valid for supporting those with communication problems. However there is a difference in emphasis, as current accessibility guidelines focus primarily in providing access to the visually impaired, for example giving text alternatives to images. Conversely for access to Web sites to be fully facilitated for symbol users, symbol alternatives to all text would need to be provided, which is clearly an onerous task for any Web site developer.

However much can be achieved without having to resort to such an extreme—fortunately many of the general recommendations for improving accessibility are also valid in providing some support for those with communication difficulties, particularly when the broader issues of usability are taken into consideration as well.

3.1 General issues

3.1.1 Coding

• Ensure that any Web page images have ALT tags.

• Avoid using graphics for text, as users will not be able to change the text and background colours when text is presented in this way.

• Ensure pages are clearly structured within the HTML, i.e. use of titles and headings for pages.

• Provide text summaries of complex charts and tables. The LONGDESC attribute can be used to provide this within the HTML page.

• Provide metadata to add semantic information to pages and sites. More detail is needed on how this information can better meet the needs of all users.

• Frames create some problems for access and so when in doubt implement a no-frame version of the site using the NOFRAME option. Having more than two frames on display at any one time should also be avoided.

• Ensure that core functionality does not depend on Javascript, Shockwave, Flash or other extensions or plug-ins. Where such functionality is provided it is important that it can be accessed via the keyboard. It may also be useful to use NOSCRIPT to direct the user to either an alternative version of the site or instructions on how to access the information in another way.
• Where extensions are used, ensure that they are also accessible from keyboard options, e.g. where mouse rollover effects are used make sure they can be accessed via the tab key and enter function.

3.1.2 Layout

• Carefully plan the layout of the home page so that it is immediately obvious what service or information is being provided. Aim to make the subject of the material clear at a glance, even to a non-reader. Place images next to, and not as a background to, the relevant words.

• Use a consistent screen layout. Always put on-screen controls and displays in the same places on different screens. Also ensure that any controls operate in a consistent manner.

• Ensure large text is available and used where possible. Set defaults to include 14 point font text size as a minimum. However, refer to font size within documents in relative rather than absolute terms. Even though some browsers can override styles, the use of cascading style sheets is recommended to allow different styles to be set up for whole Web sites easily.

• Ensure pages can be viewed on a display set to 800 x 600 resolution if necessary. Some users may be using older computers with relatively small displays and other users may require larger fonts. This resolution may therefore be set up as default on many machines being used.

• Use simple to read fonts. Where small fonts are used sans serif are easier to read, but otherwise just use common fonts such as Arial or Times New Roman. Avoid block capitals, italics or underlining as these are harder to read.

• Keep lines left justified with a ragged right edge.

• Avoid background graphics as they can make the text difficult to read and limits the ability to change the font characteristics and background colour.

• Allow presentation aspects to be configured using cascading style sheets. Type, size and colour of fonts and background should be easily configurable, as there is no one ‘best’ combination of text, font size and background colours. In addition image positioning and text highlighting can also be set up using style sheets.

• Use top loading of content, i.e. provide a summary of the Web page at its beginning.

• Provide text summaries of complex charts and tables. The LONGDESC attribute can be used to provide this within the HTML page.
• Ensure that there is a site map, and ideally indicate the user’s current location on that map. This will facilitate navigation for all categories of users.

• Use frames with caution, and ensure they are clearly labelled with meaningful headings. This is particularly important to facilitate access by screen reading software as the frame heading will provide context information for the user.

• Ensure that only one active window is open at any one time. Avoid implementing links that open new windows and keep the old one running in the background, as this can make navigation difficult due to users being unable to use all browser functions (i.e. back function) in the new window.

• Ensure all messages and instructions stay on the screen until no longer needed.

• Avoid the use of scrolling windows where possible. It is better to use internal links within a page rather than demanding users operate a scroll bar. Scroll bars add an extra layer of complexity to reading Web pages and horizontal scroll bars should be particularly avoided. Where scrolling is implemented it should be possible to also access this using the arrow keys and page up/page down on the keyboard.

• Optimise pages for fast loading. Avoid having a number of large images on each page. Use thumbnail images to minimise download times, allowing a larger version of the image to be subsequently selected.

• Where possible, design Web pages which can be downloaded and read off-line.

3.2 Physical and sensory issues (access and navigation)
The general advice included in section 3.1 is appropriate for supporting less disabled users with minor to moderate physical or sensory impairments. The following guidelines are targeted at supporting those with more severe difficulties, in particular switch users and also those people using screen reading software. Very few of the target users of WWAAC software are likely to be severely visually impaired (i.e., registered blind), but many of the principles appropriate for supporting screen reading software also have value in supporting AAC users, as well as other disability groups. Furthermore, people with severe hearing impairment are seen as being a relatively low priority for the WWAAC project; however, a selection of guidelines are included for completeness.

3.2.1 Coding
• Provide keyboard support for all functions. Avoid reliance on point and select input devices such as a mouse. This should also include supporting
keyboard shortcuts and the setting up of hot keys. Also consider supporting limited functionality of the application with a maximum of four keys. Note that the space, enter, up arrow and left arrow are common keys used by some accessibility software and hardware, and these require compatibility with serial keys.

- It is understood that the serial port does not have any long-term future as the preferred way of connecting AAC devices. Advice may be needed on other ways of connecting peripherals to computers, e.g. Firewire and USB ports.

- Set up the preferred tabbing order of table elements for Web pages using the TABINDEX function.

- Consider setting up keyboard shortcuts on Web pages using the ACCESSKEY function.

- Make sure that the language used on the page and any changes in language are clearly marked using the LANG attribute.

- Summarise graphs and charts with the LONGDESC attribute.

- Ensure that abbreviations and acronyms are explained using the ACRONYM and ABBR attributes. Also use BLOCKQUOTE to provide references to quotations.

- Ensure that the site’s core functionality does not rely on plug-ins or add-ons that a screen reader may not be able to handle. These include embedded code such as Javascript and plug-ins like Shockwave and Flash. Where such functionality is provided it is important that it can be accessed via the keyboard. It may also be useful to use NOSCRIPT to direct the user to either an alternative version of the site or instructions on how to access the information in another way.

- Consider having a description attribute in the <embed> and <bgsound> tags so that people with severe hearing impairment can find out about any background sound used on a Web page.

3.2.2 Layout

- Provide content that, when presented to the user, conveys essentially the same function or purpose as auditory or visual content. Aural information should be synchronised with visual information. Added visuals should not be distractive.

- Ensure that on screen buttons are large, i.e. 2 cm or more and well highlighted. Simple background images will also make the highlighted targets easier to identify. Larger targets are also easier to see for those
with some degree of visual impairment, and it is believed that many AAC users may also have undiagnosed visual problems.

- Limit the number of links on any single Web page. Providing large numbers of links will make input by scanning techniques time consuming and difficult, as well as making use with screen readers harder. For spoken menus, five or six options is probably about the limit. Also fewer options are likely to be preferable for those with learning difficulties.

- Make sure all links have meaning when taken out of context, and that they contain enough information about their destination and do not just say ‘click here.’

- Ensure any embedded audio used on the page can also be switched off.

- Ensure text being read by screen reading software can be highlighted on screen and the two are synchronised. Characteristics of the synthetic voice, i.e. speed and pitch, should also be adjustable.

- Provide the facility to use different voices within a Web page. This can be used to indicate text versus links or commands.

- Test that the page can be read easily by a screen reader, paying particular attention to tables. Can the page be read a line at a time, and still make sense? Make sure that tables are summarised. Provide headings, captions and summary for any tables used. Avoid complex tables.

- Consider other forms of representation and techniques to convey the same information present in the auditory form.

- All auditory cues (such as ear-cons) and instructions should also be provided in a visual form.

- Any distinction in the level of priority given to a cue or instruction should also be conveyed in visual form.

- All cues and instructions should be clear and concise, and placed in the same location.

- Any message conveyed by a cue or instruction should only be removed when the user is ready.

3.3 Cognitive and linguistic issues (information presentation and transformation)

It is not within the remit of this project to investigate in any great detail specific guidelines for accessibility by people with learning disabilities. However, given the importance and relevance of general language and layout simplification
issues for people with cognitive, linguistic and communication difficulties, guidelines should also be supplemented with recommendations from other user groups. Guidelines aimed at easier access by people with learning disabilities and in particular people with dyslexia have been chosen to supplement this section, specifically from Mencap and the British Dyslexia Association (BDA). In meeting the needs of this specific user group, it is expected that other users will benefit, for example, those who require or prefer a simpler site for whatever reason (e.g. poor vision, foreign language, or other handicapping situations). However, such guidelines sometimes demonstrate the conflicting requirements of different user groups, and question whether there is a need for a more accessible site for some users, rather than one site for all. Such conflicts require further investigation in order to try to answer this question (see Section 6.2).

3.3.1 Coding

- Where possible, allow text fields to be checked for spelling and grammar.

- When displayed text is being read by screen reading software, provide options to ‘grey-out’ the text or have the text highlighted as each word is spoken.

- Ensure that text descriptive captions for all images, audio files and videos are clear and concise.

3.3.2 Layout

- Ensure that a limited amount of text is displayed on screen (i.e., avoid cluttered screens) and that the language used is simple and the sentences are short. A measure of text complexity needs to be sensitive enough to be used with a range of ability. Currently text complexity measures are crude, based on sentence length and number of syllables making up the words used. (See for example Appendix 2.)

- Use sans serif fonts such as Arial or Comic Sans. Other alternatives include Verdana, Helvetica, Tahoma, Trebuchet and Sassoon.

- Don’t use jargon, unnecessary technical detail or abbreviations. Often terms and long words are introduced which if not known by individuals who have learning disabilities can cause uncertainly and anxiety for them. If difficult words need to be used, then include a glossary, dictionary, or list of useful words to explain them. Ensure the Glossary can also be read by screen reading software.

- Use simple punctuation. Avoid semicolons (;), colons (:), hyphens (-), or sentences broken up with too many commas.

- Use active and personal language.
• Use short phrases and sentences using words that are in common usage. (Consider Voice of America Special English at http://www.voanews.com/specialenglish/, or the Plain English Campaign at www.plainenglish.co.uk). Use active verbs and keep your sentence length down to an average of 15 to 20 words).

• Consider presenting simple summaries of pages that can then be accessed in more depth by appropriate links if required. Note—this may also make access by screen reading software easier as well.

• Present text in a single column leaving plenty of space for borders. Text presented in multiple column form is harder to read and will also create some problems for screen reading software as well.

• Avoid the use of embedded links within text. Use bullets or numbered lists instead. Place links at the end of each section and not within the body of the contents.

• Limit the number of links on one page (a maximum number would need to be investigated)

• Limit the number of on-screen controls (it may be better to have a set-up screen rather than keeping rarely used controls active at all times).

• Minimise the use of animated banners and other dynamic images, or at least ensure they can be switched off easily. A person who has difficulty reading screens may be distracted by animation and flashing images.

• Use coloured background colours instead of white. Pale colours such as pale yellow is a good default background colour. However, allow individuals to choose their own background, as some people find certain colours reduce glare more than others. (See http://ddig.lboro.ac.uk to illustrate a simple palette for choosing background colours).

• Consider using different background colours to differentiate between different pages. Note—we should not rely on colour coding as the sole way of imparting information.

• Consider using distinct borders to delineate between text and graphics areas on screen. Use boxes for emphasis or to highlight important text.

• Limit the length of lines to 60 to 70 characters. Short lines containing hyphens should also be avoided. Use wide margins and line spacing between paragraphs to break up text. Line spacing of 1.5 or 2.0 is recommended. Also avoid dense blocks of text by using short paragraphs.
• Use bold to highlight, as italics or underlining can make words run together. (Note that this guideline from BDA indicates that underlining links could cause difficulty. See also dashed line beneath links on AbilityNet Web site at www.abilitynet.org.uk to help overcome this problem).
4. Guidelines for those developing sites specifically for AAC users

Currently there is little information on this topic, and more specific guidance in this area needs to be developed by the WWAAC consortium. Some of the issues we need to address include:

4.1 Physical and sensory issues (access and navigation)

4.1.1 Coding

No further coding guidelines, in addition to those listed above, are considered necessary here.

4.1.2 Layout

- Make it easy for the user to identify what the site is about.
- Ensure that key information and images are highlighted, but how and for which categories needs to be investigated.
- Access to both content and to links needs to be more efficient and less tiring for switch users, and mechanisms other than scanning through unwanted text and links needs to be provided.

4.2 Cognitive and linguistic issues (information presentation and transformation)

4.2.1 Coding

- Ensure that documents are clear and simple enough for this user group.
- A symbol vocabulary is needed that could be used on Web pages for a given symbol set user, especially to be used in the automatic conversion of text summaries of Web pages, rather than translation of the entire Web page.
- A symbol set for browser and within page navigation may also be needed. This may need the development of new symbols.
- Ideally the symbol set used by a particular user should be stored on the user’s own machine and reused when needed rather than images having to be downloaded from a Web site. This makes symbol concept coding an important aspect of the project.
• Allowing concept coding to be tagged within the HTML is likely to be essential in any automatic symbol conversion process for symbol users. (This would be in the user’ browser settings, so that the browser will embellish the page if setting is ‘on’ but if the setting is ‘off’ for the non-AAC user, then text only will appear.)

• We may need a new ‘SYMBOL’ tag that informs the reader that the site they are accessing is a symbol-enabled WWW page and therefore should be presented as it is to a symbol user without any intelligent filtering of content by an adapted Web browser.

4.2.2 Layout

• More work is needed on general language guidance, in particular, looking at measures of text complexity, and how this guidance can be usefully provided to Web developers.

• Consider the needs of non-reading symbol users and how a text précis can best be provided so that it can effectively be transformed into the user’s own symbol set.

• The most appropriate level of text summary needs to be investigated, i.e., for a whole site and/or for each page.
5. **Guidelines for those developing adapted browsers for AAC users**

In addition to careful design of Web pages, accessibility could also be improved by enhancing the accessibility of browser software. The majority of these recommendations come from Kasday, 2001:

### 5.1 Physical and sensory issues (access and navigation)

#### 5.1.1 Coding

- Provide an option to increase the size of small images used in links.

- Allow users to tab through selection items (supported in Internet Explorer but not Netscape 4.73). Note tab support is also needed for radio buttons.

- Provide an option to increase the size of checkboxes and radio buttons

- Provide mouse utilities such as “SnapTo” and “SmartSpeed” that work on browsers.

- Provide an option to stop or slow moving images.

- Allow users to tab to elements containing mouseovers, and provide a keyboard equivalent for its activation.

- Allow keyboard shortcuts to be set up for on-screen objects (commands). This can be used to reduce the need for large numbers of tab operations.

- Provide an option to highlight selected links. Currently this is only supported in Opera. Note—Internet Explorer allows a style sheet to be set up allowing this function for keyboard users, but the visibility is very poor. Being able to set up accessibility style sheets for a given user may also be a useful browser function.

- Make it easier for frames to be resized by giving them thick borders or a “handle” to make them easier to grab.

- Provide keyboard support for all functions. Avoid reliance on point and select input devices such as a mouse. This should also include supporting keyboard shortcuts and the setting up of hot keys. Also consider supporting limited functionality of the application with a maximum of four keys. Note that space, enter, up arrow and left arrow are common default keys used by some accessibility software and hardware.

- Set up the preferred tabbing order of table elements for Web pages using the TABINDEX function.
• Ensure that the voice output can be easily interrupted to move onto the next chunk of information or to go back to the beginning of the existing chunk of information. Simple commands are also needed to repeat messages where necessary.

5.1.2 Layout

• Ensure large text is available and used where possible. Set defaults to include 14 point font text size as a minimum. However, to refer to font size within documents in relative rather than absolute terms. The use of cascading style sheets is also recommended to allow different styles to be set up for whole Web sites easily. However, it must be remembered that Browsers can overwrite styles.

• Use a consistent screen layout. Always put on-screen controls and displays in the same places on different screens. Also ensure that any controls operate in a consistent manner.

• Where icons are used for navigation and control purposes, it is recommended that mixed text and images be used rather than text or images alone.

• Ensure that only one active browser window is open at any one time. Avoid implementing links that open new windows and keep the old one running in the background, as this can make navigation difficult due to users being unable to use all browser functions (i.e. back function) in the new window.

• Provide an easy facility to close pop-up windows, in particular for non-mouse users.

• Ensure that on screen buttons are large, i.e. 2 cm or more. Larger targets are generally easier to hit with a mouse or joystick input device and also easier to see for those with some degree of visual impairment.

• Limit the number of links on any single Web page. Providing large numbers of links will make input by scanning techniques time consuming and difficult, as well as making use with screen readers harder. For spoken menus, five or six options is probably about the limit. Also fewer options are likely to be preferable for those with learning difficulties.

• Test that the page can be read easily by a screen reader, paying particular attention to tables.
5.2 Cognitive and linguistic issues (information presentation and transformation)

5.2.1 Coding

- Provide an option to stop or slow moving images

- Ensure that the voice output can be easily interrupted to move onto the next chunk of information or to go back to the beginning of the existing chunk of information. Simple commands are also needed to repeat messages where necessary.

5.2.2 Layout

- Use a consistent screen layout. Always put on-screen controls and displays in the same places on different screens. Also ensure that any controls operate in a consistent manner.

- Where icons are used for navigation and control purposes, it is recommended that mixed text and images be used rather than text or images alone.

- A limited number of links, fewer than that for other users, is preferable for people with learning difficulties.
6. Issues in developing new guidelines

Before proposing success criteria, examples and strategies for specific guidelines in the Web Content Accessibility Guidelines (WCAG 2.0), a number of issues were discussed with experts within and outside the consortium. In addition to the WWAAC project’s user requirements and evaluation work, discussions on these issues have helped to form a basis for guideline development.

The participants in the discussions included representatives from industry and user organisations attending the WWAAC project’s Concept Coding Workshop held in Oxford, February 2004. In addition, a ‘quick and dirty’ survey was held at a workshop at the 2nd Cambridge Workshop on Universal Access and Assistive Technology (CWUAAT), Fitzwilliam College, University of Cambridge, 22nd-24th March, 2004. Following a presentation on guidelines for an AAC-enabled Internet (Nicolle et al, 2004), a discussion ensued, followed by a questionnaire completed by 15 participants. Not all the respondents included their name or organisation, but their skills and expertise ranged from computer scientists, designers, engineers, industrial representatives, ergonomists and sociologists. With varying levels of expertise with AAC and Web accessibility, their opinions or comments have been included below where appropriate (full details in Appendix 5). It is interesting to note that in most cases replies on various issues were mixed and did not relate to the level of expertise in AAC or Web accessibility of the respondents. Not all of the issues below have resulted in specific recommendations but are included here to contribute to the debate.

6.1 Alternative Sites

There is difference of opinion as to whether there should be one site for all users, or two sites including an alternative, e.g. text-only, flashless, etc., site. Arguments in favour of having one, accessible site claim that one site eliminates the need to synchronise and maintain multiple versions of the content, thus reducing costs and effort. Inevitably the ‘secondary’, accessible site may become out of date, with the main site being updated on a regular basis. Thus, those whose only access to the information via the more accessible site would end up suffering separate and unequal treatment (Sherman and Protas, 2003).

The Royal National Institute for the Blind emphasises that a text-only site can be a real problem for people with reading or cognitive problems, and even partially sighted users can benefit from a visually appealing site with both text and graphics. They also point out that a text-only site which hasn’t been updated for 6 months might be accessible for some users, but not be much use to anyone (Accessible information, Frequently asked questions, www.rnib.co.uk). On the other hand, Mencap’s Web site for people with learning disabilities (www.mencap.org.uk) uses a lot of graphics and tables to help its target audience, and so they justify developing a separate site with the...
same content using text only for people with sight problems. Experts have also suggested that the crucial parts of a site could be marked to make it easier to create and update a simplified version.

According to WCAG 1.0, Guideline 11, an alternative text-version of the content is allowed only “when other solutions fail because alternative pages are generally updated less often than ‘primary’ pages” (WCAG 1.0). However, according to an editorial note in WCAG 2.0 Guideline 3.1 (1 March 2004), this advice seems to no longer exist in WCAG 2.0.

Text-only versions of Web sites, especially if produced automatically, may not comply with the WCAG and therefore they may not meet all users’ needs, for example those of people with visual impairments. It is important that the aims of an alternative version of the site are made clear, and the sites must be tested to make sure that they are achieving those aims (Office of the E-envoy, 2003).

The identification and consideration of contradictory accessibility guidelines have as far as we can determine not been adequately addressed. From a Web designer’s perspective this is particularly important when deciding whether to design a single inclusive Web site or one which contains material specifically designed for a particular type of user. In fact, if we follow the path of having alternative sites, this could potentially mean having several sites, and not just 2, to accommodate the needs of specific user groups! It is felt that none of the existing standards identify or consider such important factors.

Specific contexts of use and application areas also need to be considered. Simplified versions of Web sites already have to be developed for use with, e.g., wireless application protocol, or WAP. The WAP example emphasises why alternatives are accessible, even desirable, for some end-users and some contexts. However, further research is still needed in order to best cater for different user groups, but still providing flexibility for individual choice and preferences.

According to the mini-survey conducted at CWUAAT (Appendix 5), opinion was varied as to whether there should be one or two sites. When participants at the CWUAAT workshop were asked if there should be both an original site plus a text only/flashless, etc., site, or if there should be a single site more accessible to all, the replies were as follows:

9/15 respondents said there should be only 1 site.
6/15 respondents said there should be 2 sites.
1/15 respondent preferred 2 sites, but suggested 1 if possible.

It was noted that a ‘design for all’ solution is not really possible, even if a ‘design for many’ is. Considering the context of use and specific application areas, it was pointed out that 2 sites are also useful for people on dial-up. It was also suggested that 2 sites may be needed initially, moving to one site in the future. This, for example, is the case with the UK’s Tesco grocery chain. At the moment, there is an alternative on-line ‘Access site’ at
www.tesco.com/access/, but it is understood that they are moving towards one site for all in the future (Howell, 2004).

It would appear that, ideally, there should be one accessible site. However, if there is a second site, it must be updated as often as the original site. It is also suggested that a standard mechanism be employed to tell the user that there is a more accessible version of the Web site. Techniques suggested in WCAG 1.0 are (see 4.3 in Appendix 1):

- Provide links at the top of both the main and alternative pages to allow a user to move back and forth between them, and
- Use meta information to designate alternative documents, so that the alternative page can be automatically loaded based on the user’s browser type and preferences.

Our survey identified other suggestions for standardising the link to alternative pages, for example, providing a meaningful image or having a single opening page with the two options (combined with automatic browser capability detection). All the various options (Appendix 5) still need to be discussed further, but would provide some possibilities for WAI to consider.

### 6.2 Conflicting Needs

It is clear from the research of the WWAAC project that whilst there is limited and fragmented advice currently available, there is no comprehensive source of information about the design of Web pages for people with learning or communication difficulties, and even less information on designing sites to facilitate access by symbol users. Current guidelines in this area are primarily focused towards the simplification of text content, supplementing text with images and providing the opportunity for speech synthesis of text content.

In addition, research on the design and functionality of browser software is also important to recognise. Whilst it will not be possible to provide general guidelines that encompass all disability groups in the most optimal way, it is a desirable objective to try and maximise the numbers and range of users that can access Web sites developed for use by the general public. The developers of the AVANTI Web Browser (at present a lab-tested system only, with no open field trials) are exploring ways of providing more adaptable and usable interaction for people who are able-bodied, blind and motor-impaired. AVANTI’s Unified User Interfaces enables adaptability at the start of each interaction session, according to the user’s abilities, expertise and usage characteristics, things which are assumed to remain unchanged during that session. It also employs adaptivity techniques which will dynamically select and modify aspects of the user interface according to interaction events detected at run-time, e.g. if the user has a high error rate (Stephanidis et al., 2001). The EU IST IPCA project (www.ipca.info/desc) is also working on a smart Web browser to facilitate interaction with Internet services by people with severe motor and speech disabilities. The project will not be developing a new browser, but will extend functionalities of Open Source browsers in order
to allow the user a faster, customisable and smart interaction with Web-based applications.

The diverse needs of different disability groups make it difficult to produce general recommendations for Web site design, as the needs of one disability group may conflict with the needs of another. For example, a site that uses a high degree of visual imagery in its content is less appropriate for a person with a severe visual impairment, whilst for those with communication problems, sites with a high degree of text content will also be less than optimal. The cognitive and linguistic abilities of users will also be a limiting factor in how much variation can be accommodated in a Web site designed for general access, as the level of content needed for a person with a severe cognitive impairment to understand a Web site could be considered trivial by more able groups. Some of the techniques used to make a site more interesting to those with learning difficulties, such as dynamic images and active mouse rollover effects, could also make a WWW site less accessible to some user groups, particularly if extensions to HTML such as Flash or Shockwave are used. Some access software may also have problems dealing with Javascript, and so this needs to be used with care (that is, it must be possible to access essential functionality without the use of a Javascript-enabled browser).

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 a text-readable form is, therefore, of a high priority. The conversion of written text into a spoken form is also seen as a high priority for accessibility, supporting a wide range of disability groups. People with visual impairments benefit considerably from screen reading software, and, in addition, those with communication difficulties are also likely to prefer aural to written forms of communication. However, some users with learning or communication difficulties will also require images or symbols to augment or replace written text. However, many Web pages are currently image intensive, making it difficult for some users to filter relevant from irrelevant information. For a person with communication difficulties this may be as difficult to understand as a text-based site, and assistance is therefore needed to filter salient images from those added purely for visual appeal. Whilst some guidance within existing mark-up languages can be provided, language extensions may also be necessary to fully achieve this objective.

The requirements of people with dyslexia (See Appendix 1, section 6.3) are considered separately from other people with learning disabilities to further demonstrate the difficulties in identifying appropriate guidelines when the needs of certain disability groups conflict. For example, visually impaired people require a high contrast between text and background. This may be different to other user groups such as people with dyslexia, who may experience pattern glare effects as a result of high contrast. Dyslexic people in particular also find text which is underlined difficult to read (although human
factors advice suggests that underlining makes text more difficult to read for everyone). This is in contrast to the convention to use underlined words as a way to show a hypertext link. The convention used by the AbilityNet Web site attempts to overcome this difficulty by using spaced dashes as an underline for links (See www.abilitynet.org.uk and Appendix 1, section 6.3).

In the Disability Rights Commission study (2004), some dyslexic focus group members used speech-based software to listen to Web pages in preference to reading them. During the evaluation of the simulated Web browser (ISAAC Workshop, Odense, 13 August 2002), comments from a user with dyslexia also suggested that the WWAAC browser could be very useful to support people with reading difficulties. Although this particular user could read, he suggested that the speech support could help him improve his reading comprehension and confidence, and also the summary was a useful feature to extract important information like a description of the page and key words. However, some people with dyslexia may find this method of access unhelpful, even though it could be considered to help improve their reading skills.

According to Beacham et al (2003), dyslexic students should be allowed to use active reading and learning strategies while performing particular tasks. The reader needs to be able to concentrate on the meaning of what he or she hears, rather than the word that he or she is seeing. What is seen and what is heard are 2 different tasks to a person with dyslexia, and therefore, the combination of the media (movement of the outline around the text and the spoken word) is unhelpful and could distract the reader from the task at hand, i.e., understanding the content. Ideally, however, the rest of the page could be greyed out when reading a particular paragraph. In contrast, if the task were proofreading, and the task were to read word by word, then the line around the word would be acceptable in order to help focus on the individual word rather than the meaning of the full text. Possibly these issues slightly overemphasise the benefits of adaptive technologies for users with dyslexia, as opposed to simple, well displayed pages. However, they should at least be considered by the User Agent Accessibility Guidelines (http://www.w3.org/TR/UAAG10/).

6.3 Simplicity of Content

Complexity of many Web sites, and the language contained within them, can be a serious barrier to people with language and communication disabilities. However, simplified sites would also help many other people, even for those who have to read, or are not used to reading pages of information from computer screens. As can be seen in Appendix 2, Microsoft Word can display information about the reading level of a document, basing its readability scores on the average number of syllables per word and words per sentence.

Flesch Reading Ease score
Rates text on a 100-point scale; the higher the score, the easier it is to understand the document. For most standard documents, aim for a score of approximately 60 to 70. However, a score of approximately 70
to 80 is recommended for people with dyslexia, and this could probably also be applied to other user groups with communication or learning disabilities (British Dyslexia Association).

**Flesch-Kincaid Grade Level score**
Rates text on a U.S. grade-school level. For example, a score of 8.0 means that an eighth grader (13 year old) can understand the document. For most standard documents, aim for a score of approximately 7.0 to 8.0. However, a score of approximately 5.0 is recommended for people with dyslexia (British Dyslexia Association). This means that by using short sentences, and not by dumbing down vocabulary, a fifth grader, i.e., a Year 6, average 10 year old, can understand the document.

These scores emphasise the particular needs of certain individuals, and can provide guidance to the Web and content developer to make the text more readable for more people. In addition to the recommendations above, the British Dyslexia Association also provides other advice for calculating the readability of text. They suggest a simple method called the Five Finger Test which we could equally apply to the content of Web sites. Text in italics below has been added by WWAAC to the original wording from the British Dyslexia Association in order to focus on Web-based content:

- Choose a book (or Web site) you like
- Open it in the middle (or go deeper into the Web site, away from the home page)
- Try to find a page without pictures.
- Start reading at the top. Go on until you reach a word you do not know.
- Put your little finger on it.
- Continue reading. Put a finger on each word you do not know.
- If you run out of fingers before you get to the bottom of the page, the book (Web page) is probably too difficult for independent reading.

If Web pages were able to offer this strategy as a feature, it may help dyslexics, and other user groups, decide whether the Web site is suitable for them. Web developers could insert a tag indicating that the page is ‘plain language’ ([www.plainenglish.co.uk](http://www.plainenglish.co.uk)) or ‘special English’ ([http://www.voanews.com/specialenglish/](http://www.voanews.com/specialenglish/)), or possibly indicating a language level, so that Web browsers could act upon this information based upon the user’s needs and preferences. In any case, plain language should be used for any summaries of content, which would make it more accessible not only to those using symbol and screen readers, but also to everyone else. Ideally, a Web authoring tool, as that developed in the WWAAC project, could prompt the Web developer to change words that are not in simple language, possibly by offering alternative words like a thesaurus (following whatever lexicon is decided upon). Ideally, it could also prompt the Web developer to change the structure (such as recommending active voice, maximum length of noun phrases, maximum number of sentences in paragraphs, etc.).
6.4 Summaries of Content

Research has shown that reading from a computer screen is about 25% slower than reading from paper-based copy. However, Nielsen (2000) recommends that 50% less, not just 25%, should be written when writing for the Web, since it is not just how fast the text can be read, but ‘a matter of feeling good.’ This requirement to write less for the Web also enforces good discipline on the writer to convey information in a concise, readable form.

Nielsen (2000) also suggests that some form of a page abstract is necessary because the page titles on their own do not provide enough information about the content. He recommends, however, that page abstracts be kept short, since search engines will display only the first 150-200 characters of the descriptive text, and in any event, users are likely to only the scan the text rather than reading it in full. In fact, one of his studies found that 79% of users always scanned any new page, rather than reading every word. Two to three levels of meaningful headings, as well as bulleted lists, and ways of highlighting key points for emphasis will facilitate such scanning of text. He points out that ‘modern life is hectic and people simply don’t have time to work too hard for their information.’ This makes the summaries and/or abstracts of content an appealing option for many people when confronted with long pages of text. The Office of the E-envoy (2003), quoting from Nielsen, state that content should ideally be displayed in 3 levels: a short, scannable headline, an intermediate précis, and the full document. This, along with clear, well structured headings, enables users to orientate themselves to what is on the site quickly and efficiently.

BrookesTalk, a Web browser for blind and visually impaired users (www.brookes.ac.uk/speech/) provides an interesting example in the use of both summaries and abstracts. A page summary is provided consisting of the number of words, headings, links, images and keywords found on a page. This allows people with visual impairments to understand the structure of the page they are visiting. In addition, BrookesTalk provides an abstract, which is a collection of significant sentences drawn from the page. This is done by extracting the key phrases consisting of 3 words (tri-grams) from the contents of the page. These are then put back into the sentences in which they were found and these sentences are then presented as the abstract of the page, amounting to about 25% of the total number of words on the page. Such an abstract enables the user to ‘scan’ the page with the screen reader, and the full detail can be read out later if required (Zajicek and Venetsanopoulos, 2000). The 2 facilities aimed to meet different needs: users found the summary more useful for Web surfing, and the abstract more appropriate for accessing specific information (Zajicek, personal communication).

Zajicek and Morrissey (2001) report that their design for BrookesTalk was informed by experiments with sighted users which showed that in assessing the usefulness of a Web page, they looked first at images, then links, and then headings. This suggests that summaries should also include at least the most representative image.
Foulds and Comacho (2003) emphasise the benefits of text summaries for people who are blind, deaf or dyslexic as an alternative method of skimming large sections of text. They suggest that the use of computer-generated text summaries is recognised as an efficient method of extracting the main themes in a document, especially where there are no abstracts, indexes, table of contents, or tagged headings within the text. Of course, consideration must be given to the type of Web page that needs summarising. Some pages will be easier to summarise than others, for example a news page could be summarised, but a shopping page with items for sale may be harder to summarise.

Nielsen (2000) prefers to see the abstract written by the authors themselves, as humans are still better than computers at writing what the page is really about. The page abstract would be contained in a meta tag with the name ‘description’ in the page header. If this guidance were made more explicit in the guidelines, the description would be more useful and used to meet the need of more users.

6.4.1 Summary of Page or Site

Finally, it needs to be decided whether the summary should be of the whole site, the page, or parts of a page. In our quick survey, participants were asked at what level they thought the summary should be: 6 experts said that the summary should be at the page level, and 3 said at the site level. 5 experts said the summary should be at the site and page level, with one of those saying ‘as appropriate.’

From this diverse opinion, the WWAAC project would recommend that the Home Page of the Web site gives a summary of the whole site, and the other pages give a summary of each individual page.

6.4.2 What the user sees

Various methods for navigating to a summary, or other Alternative Representation of the content, need to be further investigated, but the illustration in Appendix 4 provides an example as to what the user could actually see. The Alt-Representation in this example is a simple summary of the content on the Web page, which can be embellished with symbols (in this case either Rebus or PCS) to meet the needs of specific AAC users. In preparing the summary of the content in this example, certain strategies for reducing the complexity of the text were followed, e.g.

- Using the Voice of America word list to the greatest extent possible ([http://www.voanews.com/specialenglish/](http://www.voanews.com/specialenglish/)) — Voice of America was meant to be just an example of simple English, and the intention was not to recommend it as the best example for the European cultural and
contextual setting. Note, however, that flexibility is needed in using such a word list, as proper nouns and terminology specific to the application area, e.g. BBC and workshop, could not easily be avoided. These could be made more accessible by providing a glossary or defining terms within the text. Alternatively, users have suggested the possibility of selecting and right-clicking on an acronym or technical term to see or hear a definition.

- Using short, simple sentences, and active rather than passive verbs.

A Web authoring tool could encourage and enable this process. As noted in Section 6.3, a Web authoring tool could prompt the Web developer to change words that are not in simple language, as well as provide a prompt to create a simple summary of the whole site, the page’s content, or part of a page, by means of ‘in-page annotation’. This would also be supplemented by symbol support, if the Web page is concept coding aware, as already implemented by the WWAAC project’s Web Authoring Tool. The summary could be displayed as either a pop-up window, preferably with the background page greyed out to minimise distraction, or could take the user to a new page, similar to the summary produced by the WWAAC Browser.

6.5 Top Loading

Since Web users do not read everything they see and tend to scan, Nielsen recommends that a Web page should start with the conclusion. This can be described as an ‘inverted pyramid style’, ensuring that the ‘Who’, ‘What’, ‘Where’, ‘When’, and ‘Why’ of the text appears at the beginning, followed by the other main points. This means that text from the bottom of the page can be cut out, or in effect not read by a screen reader, without the user missing any of the most important points (Office of the E-envoy, 2003).

One idea to consider is to develop Web pages with progressive complexity of content. In order to facilitate access to Web site content, one existing strategy (WCAG 2.0, Guideline 3.1) is that vocabulary should be used that is likely to be familiar to intended readers. Whilst this principle is sound, it does limit the inclusiveness of Web pages to a wider audience, as site complexity relevant for one user group may not be appropriate to another. It is therefore proposed that as a general accessibility principle it may be better to provide a progressive complexity for both site and page content, so that people with different cognitive abilities may be able to obtain information from the same Web site.

This is similar to the established principle of top loading Web page content to ensure that a page’s content is summarised at the beginning of a page. However, we believe that this principle could be extended to also cover complexity of Web content, ensuring that the language used within such a summary is as simple as possible, and that complex information such as technical terms, acronyms and abbreviations are only introduced later in a page.
We believe that this would facilitate page navigation with screen readers and also make it easier for a person browsing to get a simple overview of page content. This would also facilitate the use of automatic translation systems to give overviews of content in other languages (including symbol systems). The same principle could of course be applied to the complexity of the entire site’s content — the higher-level pages of a site providing a simple overview of the subject matter being addressed, with added complexity and detail being obtained by selecting pages further into the site.

This is supported by Nielsen’s suggestion (Nielsen, 2000) that higher level pages should minimise the number of graphics, especially large ones that require long download times. Only when the user has indicated a particular interest in a topic area should more and larger graphics be introduced. This accommodates the need for interesting images on a site, but also gets over the difficulty of long download times until the user makes a definite decision to follow links to more specific pages and thus more and larger images, as well as more detailed and technical content.

6.6 Tagging Images

Dealing with different types of image content in Web sites is particularly critical for users who are not able to deal with large amounts of information. In order to get readers to focus on the essential elements of a Web page, Nielsen (2000) recommends stripping away ‘as much of the fluff as possible’ (i.e., the ornately embellished graphics that are taking up space but communicating a minimum of information). Tagging the most representative image conforms to Nielsen’s comment (2000) that the home page should answer the following questions for the first-time visitor: ‘Where am I and what does this site do?’

Currently, there is no convenient way of flagging the importance of a site’s images in understanding the content of a site, and all images are treated as being identical. On the other hand, background images, which are embedded differently in HTML, can be differentiated by browsers. With regard to meaningless images, Nielsen (2000) recommends that these should have an empty ALT string, rather than no ALT text at all — using an empty string (""") is a convention to indicate that the image is purely decorative or is not trying to convey any meaningful information. For people with visual impairments, only then will a screen reader know that this image has no meaning and will move on to the next meaningful content. If no such string is present, the screen reader will feel obliged to tell the user that an unknown image is present, because it is impossible to tell if it is important or not, or if the Web developer just forgot to include any description.

This contrasts significantly with the way that text is handled within mark-up languages, allowing titles, headings, and other aspects of text emphasis to be highlighted. Some way of marking those images that are essential to understand the content of a Web site is needed, so that attention can be given to these images in any automatic processing of Web-based information. One
application of this could be to identify the most salient, or useful/informative image on a site’s home page, which could in fact be just a stylised brand name or logo. This could then be used in the automatic creation of a thumbnail image representing the site’s content for non-text-based browsers. This suggestion in fact came directly from one of the users of the WWAAC prototype browser, who asked that when adding a Web site to his list of favourites, a symbol, logo or thumbnail image be assigned automatically as an alternative presentation to text. Resolution size of the graphic needs to take into account the fact that if it is going to be reduced in size for use on the Favourites page, the higher the screen resolution the smaller any given graphic will be displayed (Nielsen, 2000). Therefore, such a representative image needs to be kept clear and simple.

In our mini-survey, experts were asked what the categories should be in developing a markup language for images, and in an ideal world, what would be the most useful for end users, and especially those with communication needs. More detail can be found in Appendix 5, but some of these responses are listed below:

Background (although these images are embedded differently in HTML, so browsers can differentiate these anyway)
Key content
Illustration / technical
Decorations (also things like bullets in lists)
Advertisements (consider pop-ups)
Transactional, informational, and entertainment.

However, since non-content images (e.g. spacers) are already marked up with the ALT tag, it was suggested that only those images with useful content should be tagged. It was also suggested that a ranking similar to Nielsen’s ranking of usability problems in heuristic evaluation could be used:
1 = vital for understanding the content of this page.
2 = important for understanding the content of this page
3 = relatively unimportant for understanding the content of this page.
4 = cosmetic only
5 = third part material, including advertising.

Advertising is an interesting issue. If a commercial company has produced an accessible site, they will, reasonably, want the user to receive their advertisements. However, if future guidelines mean that advertisements will have low prominence, this may discourage industry from producing accessible sites. Experts were asked whether they thought that advertisers would want priority when tagging their images, and if so, should we bother even suggesting this. Opinions vary (See Appendix 5), and comments and suggestions still need to be considered further, but could provide some useful options for WAI to consider.

6.7 Navigation mechanisms
In his section on people with cognitive impairments, Nielsen (2000) recommends the use of site maps to enable people to visualise the structure of the information. He also suggests that these users could be aided further if the browser updated the display of the site map with the navigation path and the location of the current page. In their studies of people with disabilities, including people with learning disabilities, the IRIS Project (Abascal et al., 2003) also emphasises the importance of a site map and suggest ‘breadcrumb navigation is a feature frequently utilised that improves usability of the Web site.’ Such advice is surely useful for anyone who gets lost in a maze of complicated Web pages. Simple structures such as a 2 or 3 level hierarchy are also easier to understand and navigate. This raises the interesting issue of how best to present a site map or structure to users who are blind and use screen readers.

Another issue to be considered is the order in which content is displayed and the order in which it appears in the source code of the document. Screen readers will follow the order in which the content appears in the source of the (HTML) document, not the order in which it appears on the Web page. And so, for a blind person using a screen reader, the earlier the content appears in the source, the sooner a screen reader will read it to the user, even if that same content is displayed at the bottom of the page. For switch users or others using screen readers, if the source code is not optimal, more could be done to enable them to navigate more easily to or through the content and links on a Web page, for example, by implementing ‘skip-to-content’ or ‘skip to links.’

Appendix 4 provides an illustration of ‘skip to content’ and summary of the content (also see Section 6.4.2.)

**Skip-to-Content**

In our mini-survey, experts were asked if they thought it is a good general design principle to have a ‘skip to content’ link at the top of the page when there are already a number of links there (an example of a site that has implemented the ‘skip to content’ link is http://accessibility.kde.org). Out of 13 replies, 10 gave a positive response, with some reservations and comments (See Appendix 5).

Experts were also asked if the ‘skip to content’ link should be transparent. Out of 7 replies: 5 gave a fairly positive response, with some reservations and comments. One respondent said that it was not vital to be transparent, but certainly acceptable, while another respondent said that it should probably be transparent because otherwise there would have to be another link on the page, which increases confusion and difficulty.

A number of suggestions were offered as to how best to navigate to Alternative Content or Representation of the content (e.g., a summary of the content, with symbols if required). Suggestions included that control rest with the user, that style sheets should be used, and also that existing HTML 4 features be used to provide alternative content (ALT, LONGDESC, TITLE). It was also noted that in-page ‘transparent,’ rather then hidden, content, could
be rendered by any given browser, if well designed and consistent, and also that hidden tags could point to separate pages, on the assumption that alternative pages will be smaller and hence faster to download. It was emphasised, however, that all representations of content should be treated equally, and that the AAC version should not be considered a ‘secondary’ version.

Skip-to-Links
When experts were asked if they thought it was a good general design principle to have a ‘skip to links’ link, out of 11 replies, 7 gave a positive response, with some reservations and comments as given in Appendix 5.

Experts were also asked if limiting the number of links on a page, what would be a reasonable number of links to recommend. The replies ranged from 5, 5 +/- 2, 7 +/- 2, ~10, and their comments ranged from ‘impossible to determine’ to ‘it depends, as very many Web pages are far too cluttered.’

It would seem sensible to suggest no more than 10-12 links on a page. If this number were chosen, then they could easily be associated with the numerical or function keys on the keyboard to provide another method of navigating through them.

6.8 Search engines
A search engine is the most common way people arrive at a Web site, followed by arriving at a new site via links within emails (Nielsen, as reported in Office of the E-envoy, 2003). It is therefore important that search engines are not only easy to use in conducting a search, but that the search results are easy to interpret and follow.

Firstly, search engines should ideally provide a spell checker (as many already do and as already suggested by WCAG 1.0 Techniques), whereby any search terms for which no hits were found would offer a list of alternative spellings to repeat the search (e.g., Nielsen, 2000). This would benefit everyone, but especially people with low literacy, people with dyslexia, and of course poor spellers or typists. Nielsen also recommends that a list of keywords be included in a Meta tag in the page header, to be used to determine the relative ranking of the retrieved pages in the search results. He suggests that the keywords should include both simple terms (e.g., ‘bus’), as well as compound terms (e.g. ‘double-decker bus’) in order to accommodate the greatest number of users’ search queries.

The IRIS project also make complementary recommendations for accessibility based as a result of their studies with people with disabilities, including people with learning disabilities. They suggest that the search engine must (Abascal et al., 2003):

- Be available and visible on all pages
- Carefully reflect the content and functionality of the site
• Accommodate weak writing skills, be able to overcome any typing or spelling mistakes, and recognise synonyms and different verb or noun forms
• Display the results of the search before any other information such as advertisements or related links), and
• Be able to suggest alternative keywords according to the users’ history of search queries.

The IRIS Project also found that the most mentioned issue by all disabled participants in their study was the need for support in navigating a Web site and understanding the information presented. Therefore, it is recommended that the search function should be able to interpret and manage the output for the user by pulling together the information and providing assistance to the user in understanding the structure of the Web site (Abascal, et al., 2003).

Some progress has been made to provide an alternative to text-based Web searching for people who have difficulty with reading and writing. Both the WWAAC Web Browser and AbleLink Technologies’ Web Trek Visual Search (www.ablelinktech.com/) provide an easy, picture-based facility to enter a search term in a search engine. The search results, however, even though accessible, often prove daunting to users. More work is needed in designing the output from search engines to be more usable.
7. WWAAC Project Recommendations for WCAG 2.0

Even though some AAC users would benefit from Web sites being developed in symbol form, it is clearly not an efficient use of resources for Web developers creating more general purpose Web sites to invest a considerable amount of effort in translating Web content into symbols. However, it is reasonable to expect that developers follow simple guidelines, restricted to the essential principles, that can make such WWW sites more accessible to a wide range of disability groups, including those using AAC products to communicate. If standards-compliant content is produced by Web developers, then intelligent browsers will be able to render it accessible to users with disabilities. In addition, intelligent Web authoring tools need to be developed to assist the Web developer in reducing the complexity of content so that it will be more understandable by not only users with cognitive and communication difficulties, but also by those who speak a different language.

The user requirements activities and the evaluation of the WWAAC project’s adapted Web browser have provided valuable and unique insight into the guidance that is needed by developers to make the Internet simpler to access by people with complex communication and physical needs. Whilst the primary objective of the evaluation activities in the WWAAC project was to further develop the alpha and beta versions of the prototype software, the project has also identified some areas where further general guidelines are needed to ensure that Internet sites can be more accessible for those who use vocabularies of symbols as their primary means of communication, without conflicting with the needs of other disability groups (some of this section first published in Poulson and Nicolle, 2002; 2003 and 2004).

The evaluation results that particularly highlighted the need for new guidelines, or success criteria for existing guidelines, were the following:

- AAC users (and others) need an easy way to add a clear image for a new favourite site.
- AAC users (and other users) need to be spared extraneous information and should be able to filter most important text and images
- Web developers need guidance in providing a simple summary, which would also support symbol translation for AAC users
- Many users could benefit from easier navigation to Content or Links

The recommendations below, with rationale based on the WWAAC project’s user requirements and evaluation work, provide suggestions for success criteria, examples, and strategies related to draft guidelines in WCAG 2.0, working draft dated 1 March 2004. In some cases, the suggestion points towards a browser solution that would render content for specific groups of users, rather than relying on changes to the Web page itself. WCAG 2.0 has
been chosen as a framework, rather than WCAG 1.0 in order to facilitate integration with current drafts and discussions.

The rationale for the proposals are based on the WWAAC project’s user requirements (User Requirements Document, WWAAC Deliverable 2) and evaluation work (Final User Evaluation Report, WWAAC Deliverable 11), as well as additional comments from experts, including the Concept Coding Workshop and the Workshop held at CWUAAT.

Recommendation 1:
Provide a clear representational image on the site’s home page.

WGAG 2.0 Principle 3: Content and controls must be understandable.
Level 3 Success Criteria for Guideline 3.1:
Ensure that the meaning of content can be determined.

It is recommended that the home page contains at least one image (which could be a photo, graphic, diagram, etc.) which clearly represents the content of the site. Web authors should ask themselves the following question: “If I just looked at this image without reading supporting text, would I be able to guess correctly what the site is about?”

Rationale
Based on feedback from users about their Favourites Page, identification of the most representative image would enable people with complex communication needs (and others) to more readily guess what the site is about. Tagging the most representative image in the content could be used in the automatic creation of a thumbnail image representing the site’s content for non-text-based browsers. This suggestion in fact came directly from one of the users of the WWAAC prototype, who asked that when adding a Web site to his list of favourites, a clear symbol, logo or thumbnail image be assigned automatically as an alternative presentation to text.

This thumbnail should be large enough to facilitate recognition (e.g. minimum 64 x 64 pixels), and because it is likely to have to be reduced to a thumbnail, it should therefore be simple enough so that it will be clear and intelligible when reduced. This tag could also be used to provide the most representational image on the page’s summary, with the Alt tag saying that this is the image of the site’s content, with longdesc to describe the image in detail.

Another way of providing a suitable image for the favourites page would be to provide a clear thumbnail image of the page itself. Some sites already provide a favourite icon used by modern browsers to add a small graphic to the favourites page. But, for people who use AAC and the envisaged usage of the WWAAC browser, a small graphic of the entire home page of the site may not be large enough, or may be too detailed. A graphic of the entire page, in a much larger size, may facilitate recognition of the Web site on the favourites page by end users. The pixel size of the graphic will depend on the screen resolution, but it is suggested that the minimum size be 64 x 64 pixels.
However, this needs to be considered in a similar way to computer displays in general (for example, with reference to appropriate character height at a particular viewing angle and distance). More work is therefore needed to refine this recommendation to guide the designer in calculating the size of the thumbnail based on the resolution of the screen. Ideally, alternative recommendations could be provided, e.g. for 800 x 600 resolution, then the thumbnail image would be ‘X’ (the higher the screen resolution, the larger the thumbnail would need to be). Alternatively, the image size could also be specified as a percentage of the screen size so that a single-sized image can be used across different screen resolutions.

**Recommendation 2:**
**Alt tags should provide prime information for the user, and should distinguish between salient (most prominent) and non-salient content.**

**WGAG 2.0 Principle 3:** Content and controls must be understandable.
Level 3 Success Criteria for Guideline 3.1
Ensure that the meaning of content can be determined.

Specifically under Strategies for Reducing the Complexity of Content.

**Rationale**
Based on discussions and evaluation work in WWAAC, it was found that end users, especially those with complex communication needs, would benefit from less extraneous information. Users were also at best amused and at worst annoyed when the screen reader read out text dividers like vertical brackets and ‘less than greater than’ (< >) in full. One of the Strategies for Reducing the Complexity of Content recommends “Including non-text content to supplement text for key pages or sections of the site.” Some non-text content, however, relates only to decorative images and for some users, this just provides unnecessary clutter. Furthermore, screen readers should also be able to recognise characters and images used simply for layout.

Non-content images (e.g., line, spacers and background) should already be marked up with Alt* and therefore Web browsers and screen readers should be able to render these images properly. However, this advice needs to be made explicit in the guidelines and techniques documents. In addition, key images and those that are not essential for the content of the site should be identified as such. It would then be possible for a filtering mechanism in the Browser to keep only the most salient images to meet the needs and preferences of users, and not just AAC users. Meta tags can be used to denote the image type, e.g., background, decorative, advertising, etc. (See Section 6.6 for a discussion of possible categories.) It is difficult to resolve how advertisers will deal with this recommendation, as they naturally consider their images essential and part of the funding source for the site.
Recommendation 3:
Provide simple page descriptions as metadata.

WGAG 2.0 Principle 3: Content and controls must be understandable.
Level 3 Success Criteria for Guideline 3.1
Ensure that the meaning of content can be determined.

Specifically under Strategies for Reducing the Complexity of Content:
Providing summaries to aid understanding.
Adding non-text content to the site for key pages or sections specifically to make the site more understandable by users who cannot understand the text-only version of the site.
Making it possible to convert text into symbolic languages such as those used by Augmentative and Alternative Communication (AAC) devices.

It is proposed that all pages include a simple summary of the page’s content in the form of an abstract in the meta tag description. In addition to assisting search engines, this also has considerable potential for providing support to the assistive technology user, as it is anticipated that adapted browsers could be set up to read and translate headings, titles and description meta tags rather than the main body of text. This could be of particular value in supporting symbol translation of site content, as it is considered unrealistic to try and translate whole sites. It is recommended that the Home Page of the Web site gives a summary of the whole site, and the other pages give a summary of each individual page.

The Web page author would be encouraged to provide Alt-Representation of content to the page or parts of the page by means of ‘in-page annotation’, using existing or emerging document formats, to support access to the content. This Alt-Rep would be stored within the page itself, rather than through an annotation server. See Appendix 4 and Section 6.4.2 for an example of how this could look to the user. The Alt-Representation in this example is a simple summary of the content on the Web page, which can be embellished with symbols (either Rebus or PCS) to meet the needs of specific AAC users.

Rationale
The evaluation of the WWAAC Browser raised the issue of whether the content of the summary should be for the whole site, the page or part of a page. Different options for the summary and Alt-Representation still need to be investigated further, but a discussion of these issues can be found in Section 6.4. Text used in the summary would need to take into account strategies for reducing the complexity of the content, e.g. using clear, simple language, and sentences using active voice and free of professional jargon.

Related to this work are developments taking place in Web annotation, which would allow individuals or groups of users to annotate Web site content with text and images and then share them with others through an annotation server. For example, the Amaya browser developed by W3C–WAI supports the use of collaborative annotation (http://www.w3.org/Amaya/). Such
annotation could support AAC users by allowing pages to be annotated through semantic markup with images for symbol users. Attached remotely to any Web document or to a selected part of it, they could be classified according to type, e.g., summary, definition, comment, plain language, alternative language, symbols, etc., in order to provide the content in an alternative or summarised way to best meet the needs of individual users. This strategy, however, was abandoned in favour of suggesting in-page hidden, or transparent, content, whereby the Web developer would be encouraged to add Alternative Representation of the content, for example a page summary written in plain language, or concept-coding enabled to provide text embellished with the user’s own symbols. The Browser, as in the case of the WWAAC browser, would need to be capable of handling such formats, and would recognise the user’s preferences for Alternative Representation to the content:

Alternative methods for navigating to Alt-Rep need to be further investigated, but the demonstration in Appendix 4, described in Section 6.4.2, provides an example as to what the user could actually see. The link to the Alt Representation could be either visible or transparent, depending on user preferences, and detectable by a screen reader. If visible, a standard graphic needs to be agreed to show that there is a summary of a page or of the site, and both type and the summary itself would need to be noted in the meta tag.

**Recommendation 4:**
Add clear in-page link such as ‘Skip-to-content’ near the top of the page (as some Web developers already do).

**WGAG 2.0 Principle 2:** Interface elements in the content must be operable.
Level 2 Success Criteria for Guideline 2.4:
Facilitate the ability of users to orient themselves and move within the content.

Already included in the success criteria is the following:
‘Large blocks of material that are repeated on multiple pages, such as navigation menus with more than 8 or more links, can be bypassed by people who use a screen reader or who navigate via keyboard or keyboard interface’.

The WWAAC project would suggest that the recommendation be more specific and suggest that a clear in-page link such as ‘Skip-to-Content’ should be used, which would look for substantial content (headings, long sentences,
no or few links). This would facilitate quick access to Alternative Representations of the content when required by some users. See Appendix 4, described in Section 6.4.2, for an illustration and note that the direct link to content, as shown in the example, could be either visible or transparent.

**Rationale Skip-to-Content**

Evaluations in the WWAAC project with AAC users demonstrated that switch users using a scanning interface and speech support were frustrated at having to work their way through a long list of links before arriving at the content on the page. Providing a direct link to content will facilitate quick access to the main text of the page, especially important for switch users and those using screen readers. It will also facilitate quick access to Alt-Rep. Some Web sites of course already provide a transparent direct link to content. This link should be standard practice, and should appear as high as possible in the source code of the page. It needs to be decided if the link should be transparent and only detected by the screen reader, or be provided visually as a practice of ‘Access for All.’ For AAC users, the latter is probably preferred. Using the screen reader on the WWAAC browser, the auditory feedback that it was possible to ‘skip to content’ may have been missed and only followed if it was highly visible.

**Skip-to-Links**

In addition to ‘Skip-to-Content,’ a ‘Skip-to-Links’ link should also be considered, but the benefits of having this extra link still have to be assessed. In an earlier working draft of WCAG 2.0 (24 June 2003), the editorial note to Guideline 2.1 is particularly relevant to switch users’ need to move through a long list of links. The Editorial suggests to ‘Add a definition of operable as meaning not using mouse keys or an infinite tabbing on a long doc or other unreasonably inefficient keyboard access’ and to ‘Add another definition that says something to the effect that access is efficient.’ For example, ‘. . . if a document has a very large number of links, some mechanism other than tabbing though them one at a time needs to be provided.’ ‘Skip-to-Links’ would start this process, followed by a browser’s facility to skip (for example) 5 links in order to bypass unwanted links more quickly. A ‘Skip-to-Next-Group-of-Links’ may also be useful. For example, in the example in Appendix 4, the groups of links are ‘Updates,’ ‘Character Info,’ and ‘Fun and Games.’ This may accommodate user preferences better than skipping 5 links at a time.

** Recommendation 5:**

**Consider the number, location and focus of links on a page.**

**WGAG 2.0 Principle 2:** Interface elements in the content must be operable.

**Level 3 Success Criteria for Guideline 2.4:**

Facilitate the ability of users to orient themselves and move within the content.

It is suggested that the number of links on one page be limited—a maximum number of links on a page should be agreed, but 10-12 is recommended. Avoid the use of embedded links within text. Instead, encourage the use of
links at the end of sentences, or preferably use bullets or numbered lists instead. In addition, distinguish between in-page links and links to other pages. This will help to orientate the user and will make browsing a list of links more effective and understandable.

(Please note that this recommendation differs from classic hypertext, where words within sentences represent links in order to maintain a smooth flow of text.)

Rationale
Coding for links may mean that they are ‘accessible’ but if there are 100 on a page, going through the links may not be very ‘usable’. Therefore, more consideration needs to be given to the number of links on a page and the way in which they are displayed. One of the facilitators during the Alpha Browser evaluation suggested that a finite number of links could be given as a guideline for Web design. Providing large numbers of links makes input by scanning techniques time consuming and difficult, as well as making use with screen readers harder. It would seem sensible to suggest no more than 10-12 links on a page. If this number were chosen, then they could easily be associated with the numerical or function keys on the keyboard to provide another method of navigating through them. Fewer options than 10-12 may be even better—for spoken menus five or six options is probably about the limit. Also fewer options are likely to be preferable for those with learning difficulties.

Recommendation 6:
Provide a progressive complexity for both site and page content, so that people with different abilities may be able to obtain information from the same Web site.

WGAG 2.0 Principle 2: Interface elements in the content must be operable.
Level 3 Success Criteria for Guideline 2.4:
Facilitate the ability of users to orient themselves and move within the content.

In order to facilitate access to Web site content, one existing recommendation is to use vocabulary that is likely to be familiar to intended readers (WCAG 2.0, Guideline 3.1, Level 3 Success Criteria). In fact, all the strategies for reducing the complexity of content under that guideline will do much to make the content more understandable to more people. Whilst these principles are sound, they do not necessarily enable inclusiveness of Web pages to a wider audience, as site complexity relevant for one user group may not be appropriate to another. It is therefore proposed that as a general accessibility principle it may be better to provide a progressive complexity for both site and page content, so that people with different cognitive abilities may be able to obtain information from the same Web site.

This is similar to the established principle of top loading Web page content to ensure that a page’s content is summarised at the beginning of a page. However, this principle could be extended to also cover complexity of Web
content, ensuring that the language used within such a summary is as simple as possible, and that complex information such as technical terms, acronyms and abbreviations are only introduced later in a page. This would also facilitate page navigation with screen readers and make it easier for a person skimming or browsing to get a simple overview of page content. This would also facilitate the use of automatic translation systems to give overviews of content in other languages (including symbol systems). The same principle could of course be applied to the complexity of the entire site’s content—The higher-level pages of a site providing a simple overview of the subject matter being addressed, with added complexity and detail being obtained by selecting pages further into the site (See Appendix 2 for Text Complexity Measures).

**Recommendation 7:**
Use static, rather than dynamic, content for critical parts of the Web site.

**WGAG 2.0 Principle 4:** Content must be robust enough to work with current and future technologies.

**Level 1 Success Criteria for Guideline 4.2:** Ensure that user interfaces are accessible or provide an accessible alternative(s).

In an ideal world, if a required plug-in, e.g. Flash, is not fully accessible, then an alternative solution will be provided that conforms to WCAG 2.0. However, this is not an ideal world, and many Web pages are still not accessible to all users. Web pages should, therefore, be designed so that dynamic elements can, if necessary be ignored, and critical parts of the Web site are not missed. Related to this recommendation is that images with embedded content and/or navigation should also be avoided. Therefore, it is essential that, for example, a site map is represented as a text page—that is, an image should never be used as a navigation aid. However, more work may be needed on textual site maps which may be lengthy to access with a screen reader.

This guidance needs to be made more explicit in Guideline 4.2, as well as in the following technology-supports-access issues (with the final words in italics added by the WWAAC project):

"Individuals can identify (either through site documentation or automatically through metadata) whether or not they are likely to be able to use a site. In conjunction with a search engine or a proxy server, this could be used to automatically filter out sites a user cannot access or to automatically filter to the top sites that would be most usable or at least whose critical elements use static, accessible content."

**Rationale**
Browsers (such as that developed by the WWAAC project) can identify a Web site as having some inaccessible elements, e.g. Flash or JavaScript. However, the WWAAC browser evaluations have noted some conflicting requirements in that dynamic images are often more interesting but less accessible for some users. In an ideal world, of course, all browsers should support Flash, and technologies are improving so that this may not be an
issue for much longer (See that Macromedia Flashplayer is now considered ‘totally accessible’ at www.macromedia.com/macromedia/accessibility). However, dynamic content still creates many problems for people with communication and cognitive impairments. Fast changing objects (e.g. news tickers) may be distracting and confusing for people with low reading skills, and impossible to be accessed by screen reading tools. Floating objects on top of other text may hide screen-reader cursors beyond it. Invisible text (text in the same colour as its background) and hidden texts (collapsible menus) may still be found by a screen reader or difficult to access by switch users.

Other guidance drawn from WCAG does emphasise these points. For example, in their ‘See it Right’ Guidelines for Accessible Web Design, the Royal National Institute for the Blind, state: “Do not rely on JavaScript for essential page functions.” This advice to use static, rather than dynamic content for critical parts of the Web makes the guidance more explicit to Web developers, so that if they choose to use such technologies, at least the critical elements of the Web site will be accessible to all users, who may still be free to enjoy other interactive and dynamic, but inessential, elements of the page.

It is also suggested that a standard mechanism be employed to tell the user that there is a more accessible version of the Web site, but what that mechanism should be still needs to be decided. (See Section 6.1 for comments and suggestions).

**Recommendation 8:**

**Consider a change of priorities in the Web Content Accessibility Guidelines to reflect the findings of the Disability Rights Commission report (2004).**

The WWAAC project would advise that the Recommendations from the Disability Rights Commission be considered in establishing priority levels in the WCAG 2.0, based upon the most common types of Web accessibility problems experienced by a wide range of users.

These revised priorities may also impact upon the 10 most important guidelines found on the ‘credit card summary’ of WCAG 1.0 guidelines (www.w3.org/WAI/References/QuickTips and See Appendix 4 and see Appendix 1, section 4).

**Rationale**

The study conducted by the Centre for Human-Computer Interaction at City University, London (Disability Rights Commission, 2004) demonstrated that most Web sites are inaccessible to many disabled people and fail to meet the most basic standards set by the W3C. Specifically, it found that violations of just 8 Checkpoints of WCAG 1.0 accounted for 82% of the problems users reported which were covered by the Checkpoints, and 45% of the total number of problems reported by the users. It is interesting to note that 5 of these 8 Checkpoints were not classified by WCAG as Priority 1, and therefore
A site could still have Priority 1 conformance even though it failed to meet these checkpoints (See Section 2). It is also significant that the majority of these most important Checkpoints are qualitative, emphasising that many of the problems can only be found and then resolved by direct involvement of people with disabilities in the design and evaluation of Web sites.

The 8 Checkpoints which accounted for the most reported problems in the Disability Rights Commission report (2004) were:

Checkpoints:
1.1 Provide a text equivalent for every non-text element (priority 1).
2.2 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 (priority 2/3).
6.3 Ensure that pages are usable when scripts, applets, or other programmatic objects are turned off or not supported (priority 1).
7.3 Until user agents allow users to freeze moving content, avoid movement in pages (priority 2).
10.1 Until user agents allow users to turn off spawned windows, do not cause pop-ups or other windows to appear and do not change the current window without informing the user (priority 2).
12.3 Divide large blocks of information into more manageable groups where natural and appropriate (priority 2).
13.1 Clearly identify the target of each link (priority 2).
14.1 Use the clearest and simplest language appropriate for a site’s content (priority 1).

The priority of individual guidelines now needs addressing in WCAG 2.0. For example, the need to use the clearest and simplest language appropriate for the site’s content is certainly a difficult guideline to test. However, this Guideline 14 from WCAG 1.0 has lost its Priority 1 status in WCAG 2.0 and has been relegated to a Level 3 Success Criteria for Guideline 3.1 (Ensure that the meaning of content can be determined). This only serves to downgrade the importance of reducing the complexity of content, which is a common problem for many users, and not just those who use AAC. The IRIS Project (Abascal, et al., 2003) also point out that the cognitive accessibility recommendations of the WAI are classified at the low priority level, specifically listing those checkpoints of WCAG 1.0 that benefit people with cognitive impairments, including the recommendation to use simple language. However, the IRIS project, as well as the WWAAC project, recognise the fact that efforts are underway to improve and refine the WAI guidelines in this area, but that some of these elements are not easily testable.

It is also recognised that many of the high-frequency problems experienced by users are covered by checkpoints of the User Agent Accessibility Guidelines 1.0, and also that authoring tools conforming to Authoring Tool Accessibility Guidelines 1.0 play a role in achieving accessibility (http://www.w3.org/2004/04/wai-drc-statement.html). Unfortunately the on-line documents are sometimes not particularly easy to follow, as users are led to a number of documents with overlaps in content. It is easy to get lost in such
documents and it can be difficult to find the relevant information needed. Therefore, it may be necessary to establish more effective links between the different sets of guidelines and the techniques to implement those guidelines. There is also a need to take steps to ensure that developers of Web sites, browsers, media players and assistive technologies receive training in accessibility and usability features (Engelen et al., 2003; DRC, 2004). Steps need to be taken that will make this training and implementation of the WCAG more effective.

8. Conclusions

The user requirements activities and the evaluation of the WWAAC project’s adapted Web browser have provided insight into the guidance that is needed by developers to make the Internet simpler to access by people with complex communication and physical needs. It is not the intention of this document to produce startling new guidelines for Web accessibility, as WCAG 2.0 have covered the main general principles. Instead, the WWAAC project is making more specific guidance for an AAC-enabled World Wide Web in the form of success criteria, examples, and strategies related to draft guidelines in WCAG 2.0, working draft dated 1 March 2004.

A significant contribution of the WWAAC project is also to provide more direct support for symbol users on Web pages through its open-sourced concept coding infrastructure and protocol. The vision of concept coding is that instead of images and symbols having to be transferred from one computer to another, it should be possible to transmit a unique code designating the meaning of the symbol needing to be transferred. Using this infrastructure, the WWAAC project is also developing a Web authoring tool which will enable Web developers to embellish their Web pages with symbols using the on-line concept coding database. This optional symbol support (for example for keywords, headings and summaries of content) can then be displayed by ‘concept coding aware browsers,’ like that developed by the WWAAC project. These important issues are also being discussed with and within the WCAG working group. It is expected that the concept coding work of the WWAAC project will lead to more advances in this area, and should feed into the development of techniques for a more accessible Web for AAC users. (See Appendix 6).

Whilst recommendations in this document have been developed with Web accessibility in mind, it is also anticipated that they could have broader application for the design of multimedia applications. Likewise, Web sites made more usable and understandable for users with complex communication needs could also benefit others who may be struggling due to age, disability or handicapping situations.
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Widgit Software Ltd. at www.widgit.co.uk


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- The participants at the Concept Coding Workshop, held by the WWAAC project, Oxford, February 2004,
- The participants at the workshop held at the 2nd Cambridge Workshop on Universal Access and Assistive Technology (CWUAAT), March 2004, and
- Nigel Beacham, from the IMPACT Research Group, Department of Computer Science, Loughborough University, for his contributions in the area of guidelines for designing Web materials for people with dyslexia.
Appendix 1

Sources of Information to Develop AAC Enabled Web Pages

1. Introduction

The following section collates information from a variety of sources and was used as a basis for developing the WWAAC project internal deliverable No 6: Pre-Draft Standards for Web-Based Information. This phase of the work collated relevant information on designing Web pages for the AAC community. In addition to referenced sources of information, practical experiences of developing Web pages within the AAC community have also been considered. These resources have provided the basis for the framework and overview of existing guidelines (Sections 2-5 of this Appendix) and have been drawn from in developing the recommendations in this document.

2. Scoping the Problem

Ensuring that Web pages are accessible to people with language or cognitive problems provides a particular challenge for Web pages designers, as multiple disability is common and many potential users with such communication difficulties may also face additional problems due to sensory motor difficulties as well. For example a person with cerebral palsy is also likely to have some problems with making carefully co-ordinated movement, and may require specialist switch input devices to allow them access to a computer. Others may have problems with vision, making it difficult to read a standard-sized screen display.

When considering guidelines for the development of Web pages, it is also essential to make a clear distinction between those Web pages that are designed to be accessible to the broader population, and those that are specifically designed to be accessed by people with communication difficulties. This distinction is a critical one to make, as developing Web sites that cater to a wide variety of users with differing communication and language skills is very different from designing sites with the needs of specific users in mind.

3. Developing Accessible Sites for All

Web accessibility has become a topical issue, with the American Rehabilitation Act Amendments of 1998 being a recent example. Section 508 requires that when federal agencies develop or use electronic and information technology, they have to ensure that both employees and members of the public are allowed to have access to and use of information that is
comparable to the access obtained by people who are not disabled. In other
countries the legality of not making Web accessible to those with disabilities
has also been questioned, a recent high profile case being the finding in
August 2000 that the Sydney Organising Committee of the Olympic Games
was found to have acted unlawfully in providing a Web site that was not
accessible to people who are blind.

3.1 PC Accessibility

When considering Web accessibility it is also important to remember that
accessibility is dependent on a variety of different elements, each of which
must be accessible in their own right for overall accessibility to occur. A
person wishing to access a Web site must have a suitably accessible PC for
them to be able to operate, and in the case of a person with a mild disability it
may be sufficient to tailor the interface to their particular needs using the built-
in accessibility options included in the Windows and Mac operating
environments. Large fonts, high contrast display options and mouse
adaptations can all be used to tailor standard interfaces to a given user’s
needs, and in addition there are a number of simple keyboard adaptations
that can make access easier. These include:

- StickyKeys - Allows one-finger users to operate keys needing
  simultaneous keypresses. With the feature activated, a keypress is
  remembered and has an impact on the next key pressed. For example, if
  shift is pressed it influences the next alphabetic key pressed.
- ToggleKeys - Also facilitates single-handed use or use with a pointing
  stick. Essentially this gives a tone feedback when the Caps Lock, Number
  Lock or Scroll Key are pressed so that the users is made aware these
  functions have been activated.
- BounceKeys - Repeated keystrokes are ignored. Useful if the person has
  motor tremor leading to repeated key presses.

The key repeat rate can also be adjusted. This ensures that only one key
press is accepted, and that simultaneous keypresses are ignored. This is
useful if the person has poor motor control and is likely to hit more than one
key at the same time. Typing can also be made easier by setting up typing
short cuts and using auto-correct facilities. These are powerful features that
few users bother to set up. The Disability Rights Commission report (2004)
also found (Finding 3) that the most widely used operating systems and
browsers incorporate a range of useful accessibility features, but many
disabled users are either unaware of them or do not know how to use them.
For those with higher degrees of disability more specialist adaptations may be
required. These may be relatively simple such as keyguards, replacement
keyboards or mouse alternatives, or be much more sophisticated hardware
and software solutions that allow external switches and access software to
emulate keyboard actions. Examples include SAW and Clicker 4. It is now
common for such access hardware to be connected via the PS2 keyboard
interface, and usually these are user configurable to allow a number of
keyboard actions to be emulated (Access software commonly uses space,
enter, up arrow, left arrow, 0, 1, 2, and 3). Switch access can also be made
via a connection box connected to the serial port of the computer, and standards have been established by Microsoft and others (Serial Keys) for using this port in accessible applications.

### 3.2 PC Software Accessibility

In addition to accessible hardware there has also been considerable investment in trying to ensure that software applications are also designed to be accessible. Major manufacturers have developed guidelines for developing accessible applications. Apple, IBM and Microsoft have been particularly active in recent years and provide guidance in this area.

- **IBM Accessibility (Special Needs)** (http://www-3.ibm.com/able/guidelines.htm)
- **Microsoft Windows Guidelines for Accessible Software Design** (http://www.microsoft.com/enable/)

The Microsoft guidelines are the most important because of the dominance of Microsoft in the PC marketplace. Microsoft’s guidelines include recommendations for:

- Keyboard Input - i.e., all features accessible by keyboard
- Exposing Keyboard Focus - i.e., cursor position
- Exposing Screen Elements - i.e., information about objects on screen such as windows messages
- Colour - e.g., use of high contrast modes
- Size - e.g., large fonts selectable
- Sound - providing alternatives to sound, e.g. flashing borders
- Timings - allowing adjustment of all timing by users
- Mouse Input - allowing settings to be altered
- The General User Interface - e.g., providing a flexible interface- undo facility, error recovery, restoring default settings
- Multitasking - e.g. Sharing CPU, not insisting on being the topmost window
- Miscellaneous topics - e.g., avoiding disk swapping

From the point of view of accessibility probably the most critical of these recommendations is that software functionality should be accessible totally from a keyboard, and that where possible access should be possible without the use of a mouse input or other similar pointing device. Such guidelines have relevance to the software applications being developed by the WWAAC project, and Web accessibility will be promoted by the careful design of Web browser software. Kasday (2001) provides a series of recommendations on providing enhancements to Web browsers, and lists a number of recommendations (some of which are from the Draft W3C User Agent Guidelines). These include:

- Providing an option to increase the size of small images used in links
• Allowing users to tab through selection items (supported in Explorer but not Netscape 4.73). Note tab support is also needed for radio buttons

• Provide an option to increase the size of checkboxes and radio buttons

• Providing mouse utilities such as “SnapTo” and “SmartSpeed” that work on browsers

• Providing an option to stop or slow moving images

• Allowing users to tab to elements containing mouseovers, and providing a keyboard equivalent for its activation

• Allowing keyboard shortcuts to be set up for on screen objects (commands). This can be used to reduce the need for large numbers of tab operations

• Provide an option to highlight selected links. Currently this is only supported in Opera. Note—Explorer allows a style sheet to be set up allowing this function. Being able to set up accessibility style sheets for a given user may also be a useful browser function.

• Making it easier for frames to be resized by giving them thick borders or a “handle” to make them easier to grab.

3.3 Existing Guidelines on Webpage Accessibility

3.3.1 W3C

The most significant initiative in this area is the work of the W3C. The World Wide Web Consortium was created to develop common protocols that promote its evolution and ensure its interoperability. W3C has more than 500 members from around the world and has earned international recognition for its contributions to the growth of the Web. See http://web4.w3.org/.

The W3C–WAI has drafted four main bodies of guidelines and advice for improving Web accessibility:

• Web Content Accessibility Guidelines (WCAG) 1.0
  http://www.w3.org/TR/WCAG10/
  and WCAG 2.0 (working draft)
  http://www.w3.org/WAI/GL/WCAG20/
• Authoring Tool Accessibility Guidelines
  http://www.w3.org/TR/ATAG10/
• User Agent Accessibility Guidelines
  http://www.w3.org/TR/UAAG10/
• XML Accessibility Guidelines (working draft)
  http://www.w3.org/TR/xmlgl
There are also a number of working groups actively involved in developing guidelines in specialist areas; for example, there is a draft specification for an XML markup language for speech synthesis (http://www.w3.org/TR/speech-synthesis). Many of these guidelines are valid for supporting those with communication disabilities. However, the focus of many current accessibility guidelines is primarily on providing access by people with sensory impairments, for example by providing text alternatives to images, and using captions for significant dialogue or sounds. Conversely, for access to Web sites to be fully facilitated for non-text users, image alternatives to text would need to be provided, which is clearly an onerous task for any Web site developer.

The Web Content Accessibility Guidelines developed by the W3C are currently undergoing major revision and WCAG V2.0 is now in working draft http://www.w3.org/TR/WCAG20/. This new version demonstrates how more general (less HTML-specific) WCAG might read, providing guidelines for 4 basic principles, with the goal to create Web content that will be perceivable, operable, understandable, and robust to work with current and future technologies. For each of these principles, non-technology-specific guidelines are provided, as well as success criteria (normative in nature) and also definitions, benefits and examples (all informative in nature). The most recent version consulted for the purpose of this deliverable is dated 1 March 2004, but is regularly updated.

In addition to the general guidelines, there will be a series of technology-specific checklists, which will provide information on what is required when using different technologies in order to meet the WCAG 2.0 working draft; however, these do not yet exist. Technology-specific application information is also being updated and will later become active links, containing different strategies for meeting the requirements as well as the current preferred approaches where they exist.

At the recent WAI/WCAG ‘face-to-face’ meeting at CSUN attended by representatives from WWAAC (California State University Northridge 19th International Conference, Technology and Persons with Disabilities, March 2004), some discussion took place centred around the mapping of the techniques to the guidelines and how well the various kinds of disabilities are represented. The guidelines have started to address the needs of AAC users in WCAG 2.0, but their complex needs are one of (if not) the hardest to accommodate. Hence, the WCAG working group expects that the concept coding work of the WWAAC project will lead to more advances in this area, and should feed into the development of techniques for a more accessible Web for these users.

3.3.2 AWARE

The HTML Authors Guild has set up the AWARE (Accessible Web Authoring Resources and Education) Center. Its mission is to serve as a central resource for Web authors for learning about Web accessibility. The AWARE Center was launched in April 1999 and has a special focus on the importance of designing for universal accessibility (http://aware.hw.org/). As well as
providing links to the W3C work, the site provides information and links to a wide range of practical tools that are useful for developers.

### 3.3.3 CAST

Founded in 1984 as the Center for Applied Special Technology in Peabody MA, CAST is an educational, not-for-profit organisation that uses technology to expand opportunities for all people, including those with disabilities. It is well known for producing the Bobby checking tool ([http://bobby.watchfire.com/bobby/](http://bobby.watchfire.com/bobby/)). Although it is possible to check the technical aspects of accessibility for compliance with the WAI Web Content Accessibility Guidelines, it does not cover usability aspects or the language needs of people e.g. with a learning or communication disability. User testing is crucial, as demonstrated by the study conducted for the Disability Rights Commission below.

### 4. A Summary of Current W3C Recommendations (WCAG 1.0)

The W3C WCAG 1.0 provides detailed recommendations for improving accessibility, written very much with the HTML coder in mind. Unfortunately their on-line documents are not particularly easy to follow, as users are led to a number of documents with overlaps in content. It is easy to get lost in such documents and it can be difficult to find the relevant information needed. The most useful from a developer’s perspective is the document HTML Techniques for Web Content Access Guidelines 1.0, as this also contains worked examples to show how the general principles are applied.

Conversely, the most popular W3C document is a credit card summary that just contains the 10 most important guidelines as bullet points ([www.w3.org/WAI/References/QuickTips](http://www.w3.org/WAI/References/QuickTips)). Paraphrased, these are:

- Using the alt attribute for all images and animations.
- Using client-side map elements and text for image map hotspots
- Providing transcripts and captions for audio, and descriptions of video
- Ensuring that hypertext links make sense out of context.
- Organising pages using headings, lists and a consistent structure. Using cascading style sheets for layout and style where possible.
- Summarising graphs and charts with the longdesc attribute.
- Providing other alternatives for any scripts, applets and plug ins used
- Providingnoframes options to pages and using meaningful titles on frames.
• Ensure that line by line reading of tables is sensible, and that tables are summarised

• Ensuring that work is validated carefully

In addition there is a range of advice regarding the use of colour (ensuring that colour is not relied upon to impart information), animated graphics (avoiding them until user control of such animation is possible), language (ensuring that the text language used is flagged, and there are descriptions for abbreviations and acronyms), and the layout and setting of tables. The use of headers and captions for tables is discussed in some detail owing to the problems that poorly laid out tables can cause for screen readers.

It is probably fair to say that the emphasis of the guidelines is primarily targeted at the visually impaired, to ensure that access to information is possible through simple text based browsers and screen readers. Less specific guidance is given regarding cognitive issues, reflecting in part the difficulty of operationalising such guidelines in the same way that is possible when dealing with sensory or motor difficulties.

There are a large number of screen reading applications available for use with the visually impaired, and most of these have some problems with modern Web pages. Difficulties include sites with:

• Large amounts of text

• Unusual vocabulary

• Large numbers of links

• Sites that are frame based

• Site with complicated tables

• Sites employing Javascript, Shockwave and other add ons or plug ins

• Sites with embedded audio

• Sites with significant numbers of images

As can be readily appreciated, some of the requirements of developing sites so that they can be accessible to screen reading software also facilitates access by other disability groups such as those with cognitive impairment or communication difficulties, and screen reading software is also likely to be of value for significant numbers of these users as well. There are some potential conflicts however, as images rather than text create particular problems for those with visual impairment, whilst for many with communication problems the opposite is true and images can provide more important information than text-based materials.
The Document Core Techniques for Web Content Guidelines 1.0, provides more detailed advice along with the W3C document Techniques for Web Content Accessibility Guidelines 1.0-November 2000. The most relevant guidelines for the disability groups of interest to our project are:

4.1 Providing Text Only Versions of Web pages

Significant emphasis is placed on ensuring that Web pages can be converted to text-only versions, as the following excerpt from the Core Techniques for Web Content Guidelines 1.0 demonstrates.

“Text is considered accessible to almost all users since it may be handled by screen readers, non-visual browsers, and braille readers. It may be displayed visually, magnified, synchronized with a video to create a caption, etc. As you design a document containing non-textual information (images, applets, sounds, multimedia presentations, etc.), supplement that information with textual equivalents wherever possible. When a text equivalent is presented to the user, it fulfills essentially the same function (to the extent possible) as the original content. For simple content, a text equivalent may need only describe the function or purpose of content. For complex content (charts, graphs, etc.), the text equivalent may be longer and include descriptive information. Text equivalents must be provided for logos, photos, submit buttons, applets, bullets in lists, ASCII art, and all of the links within an image map as well as invisible images used to lay out a page.

“Quicktest! A good test to determine if a text equivalent is useful is to imagine reading the document aloud over the telephone. What would you say upon encountering this image to make the page comprehensible to the listener?”

4.2 Ensuring Non-Reliance on Mouse Input Devices

Detailed advice is provided for ensuring that alternative input devices can be used.

“Not every user has a graphical environment with a mouse or other pointing device. Some users rely on keyboard, alternative keyboard or voice input to navigate links, activate form controls, etc. Content developers must ensure that users may interact with a page with devices other than a pointing device. A page designed for keyboard access (in addition to mouse access) will generally be accessible to users with other input devices. What’s more, designing a page for keyboard access will usually improve its overall design as well.”

4.3 Developing Alternative Web pages

The guidelines also address setting up alternative pages for Web sites that are accessible. The following is paraphrased from the guidelines.

“Although it is possible to make most content accessible, it may happen that all or part of a page remains inaccessible. Additional techniques for
creating accessible alternatives include: Allowing users to navigate to a separate page that is accessible, contains the same information as the inaccessible page, and is maintained with the same frequency as the inaccessible page. Setting up server-side scripts that generate accessible versions of a page on demand. Two techniques for linking to an accessible alternative page are also suggested:

1. Provide links at the top of both the main and alternative pages to allow a user to move back and forth between them. For example, at the top of a graphical page include a link to the text-only page, and at the top of a text-only page include a link to the associated graphical page. Ensure that these links are one of the first that users will tab to by placing them at the top of the page, before other links.

2. Use meta information to designate alternative documents. Browsers should load the alternative page automatically based on the user’s browser type and preferences.”

4.4 Supporting Keyboard Entry

Advice is also provided on keyboard entry:

“Provide keyboard shortcuts so that users may combine keystrokes to navigate links or form controls on a page. **Note:** Keyboard shortcuts—notably the key used to activate the shortcut—may be handled differently by different operating systems. On Windows machines, the ‘alt’ and ‘ctrl’ key are most commonly used while on a Macintosh, it is the apple or ‘clover leaf’ key.”

“Tabbing order describes a (logical) order for navigating from link to link or form control to form control (usually by pressing the ‘tab’ key, hence the name).”

4.5 Ensuring Users Can Navigate Through Sites Easily

Navigation is also dealt with in some detail, as the following bullet points taken from Guideline 13 (Provide clear navigation mechanisms) demonstrates.

- “Clearly identify the target of each link
- Provide metadata to add semantic information to pages and sites
- Provide information about the general layout of a site (e.g., a site map or table of contents)
- Use navigation mechanisms in a consistent manner
- Provide navigation bars to highlight and give access to the navigation mechanism
- Group related links, identify the group (for user agents), and provide a way to bypass the group
- If search functions are provided, enable different types of searches for different skill levels and preferences
• Place distinguishing information at the beginning of headings, paragraphs, lists, etc.
• Provide information about document collections (i.e., documents comprising multiple pages.) For example in HTML specify document collections with the LINK element and the ‘rel’ and ‘rev’ attributes. Another way to create a collection is by building an archive (e.g., with zip, tar and gzip, stuffit, etc.) of the multiple pages.
• Provide a means to skip over multi-line ASCII art

“...A consistent style of presentation on each page allows users to locate navigation mechanisms more easily but also to skip navigation mechanisms more easily to find important content. This helps people with learning and reading disabilities but also makes navigation easier for all users. Predictability will increase the likelihood that people will find information at your site, or avoid it when they so desire. Examples of structures that may appear at the same place between pages:

1. navigation bars
2. the primary content of a page
3. advertising

A navigation mechanism creates a set of paths a user may take through your site. Providing navigation bars, site maps, and search features all increase the likelihood that a user will reach the information they seek at your site. If your site is highly visual in nature, the structure might be harder to navigate if the user can’t form a mental map of where they are going or where they have been. To help them, content developers should describe any navigation mechanisms. “It is crucial that the descriptions and site guides be accessible since people who are lost at your site will rely heavily on them. When providing search functionality, content developers should offer search mechanisms that satisfy varying skill levels and preferences. Most search facilities require the user to enter keywords for search terms. Users with spelling disabilities and users unfamiliar with the language of your site will have a difficult time finding what they need if the search requires perfect spelling. Search engines might include a spell checker, offer ‘best guess’ alternatives, query-by-example searches, similarity searches, etc.”

4.6 Providing Multimedia Equivalents

Advice is also given for using multimedia to improve the comprehensibility of Web pages for people with low reading skills.

“For people who do not read well or not at all, multimedia (non-text) equivalents may help facilitate comprehension. Beware that multimedia presentations do not always make text easier to understand. Sometimes, multimedia presentations may make it more confusing.

“Examples of multimedia that supplement text:
1. A chart of complex data, such as sales figures of a business for the past fiscal year.
2. A translation of the text into a Sign Language movie clip. Sign Language is a very different language than spoken languages. For example, some people who may communicate via American Sign Language may not be able to read American English.

“Pre-recorded audio of music, spoken language, or sound effects may also help non-readers who can perceive audio presentations. Although text may be generated as speech through speech synthesis, changes in a recorded speaker’s voice can convey information that is lost through synthesis.”

4.7 Making Documents Clear and Simple

The issue of making documents easy to read is also covered, but not to a significant level. The advice given is much more general as the following taken from Guideline 14 (Ensure that documents are clear and simple) illustrates.

• Use the clearest and simplest language appropriate for a site’s content
• Supplement text with graphic or auditory presentations where they will facilitate comprehension of the page
• Create a style of presentation that is consistent across pages
• Place distinguishing information at the beginning of headings, paragraphs, lists, etc.
• Supplement text with graphic or auditory presentations where they will facilitate comprehension of the page

Some detailed advice is given regarding making sites easy to read.

“The following writing style suggestions should help make the content of your site easier to read for everyone, especially people with reading and/or cognitive disabilities.

• Strive for clear and accurate headings and link descriptions. This includes using link phrases that are terse and that make sense when read out of context or as part of a series of links (Some users browse by jumping from link to link and listening only to link text.) Use informative headings so that users can scan a page quickly for information rather than reading it in detail.

• State the topic of the sentence or paragraph at the beginning of the sentence or paragraph (this is called ‘front-loading’). This will help both people who are skimming visually, but also people who use speech synthesizers. ‘Skimming’ with speech currently means that the user jumps from heading to heading, or paragraph to paragraph, and listens to just enough words to determine whether the current chunk of information (heading, paragraph, link, etc.) interests them. If the main idea of the paragraph is in the middle or at the end,
speech users may have to listen to most of the document before finding what they want.

“Depending on what the user is looking for and how much they know about the topic, search features may also help users locate content more quickly.

- Limit each paragraph to one main idea
- Avoid slang, jargon, and specialized meanings of familiar words, unless defined within your document
- Favor words that are commonly used. For example, use ‘begin’ rather than ‘commence’ or use ‘try’ rather than ‘endeavor’
- Use active rather than passive verbs
- Avoid complex sentence structures

“To help determine whether your document is easy to read, consider using the Gunning-Fog reading measure. This algorithm generally produces a lower score when content is easier to read. As example results, the Bible, Shakespeare, Mark Twain, and TV Guide all have Fog indexes of about 6. Time, Newsweek, and the Wall St. Journal an average Fog index of about 11.”

See Appendix 2 for more details on the use of text complexity measures.

5. Using Javascript within Web pages

JavaScript is increasingly used in Web sites to make pages more dynamic, by responding to user actions (e.g. mouse movement), or by updating a page automatically. There is considerable potential for reducing the accessibility of Web sites by the inappropriate use of Javascript, and in addition such code has to be supported by the user’s Web browser. The TRACE Center has given advice for using Javascript (http://trace.wisc.edu/world/java/jseval.htm#intro) that includes:

1. **‘Trigger events with active input from users rather than nonactive triggers.’**
   An active trigger is a mouse click, selection of an option in a list, or a key press. Nonactive triggers are activated when a page is loaded, after a certain amount of time has expired, or when the mouse passes over an object. Nonactive triggers are useful for highlighting information but should be used carefully and should not greatly alter the contents of the page, unless notification is given to the user.

2. **Provide a mechanism for the user to freeze or slow-down any moving or blinking objects, particularly those that contain text.**
   Some users will have difficulty responding to or reading non-static information within the allotted time. Hopefully, in the future,
user agents will have more control over this situation or this mechanism will become inherent in the JavaScript language.

3. **Provide a `<NOSCRIPT>` option for all scripts.**
   For example:
   ```html
   <SCRIPT type="text/tcl">
   ...some Tcl script to show a billboard of sports scores...
   </SCRIPT>
   <NOSCRIPT>
   <P> To access today's scores <A href="scores.html">visit our text-only version.</A>
   </NOSCRIPT>
   ```

4. **Make scripts and applets keyboard operable** (using standard conventions)."

   In addition it is argued that scripts can be used to improve the accessibility of Web sites, by allowing the individual to select how information is presented. Examples of this are given at the site, including script to summarise the content of tables, to modify the presentation of table columns, and to allow the users to switch from frame and non frame presentation modes in a page.

6. **Guidelines for Developing Sites for People with Communication Problems**

Many general purpose sites are much too complex to make them easy to use for people with communication problems, and sites with a high degree of text content are likely to cause particular problems. It may therefore be necessary to develop custom-made sites for symbol users and others with communication difficulties.

In addition to the more general accessibility guidelines, there are also some recommendations for developing sites specifically tailored to the needs of those with learning or communication difficulties. Some good practice has been established in this area, often building directly on the work of the W3C. In some cases these guidelines are not made explicit and therefore have to be inferred from the site in question.

Few examples of tailored sites exist, but there are some developments for children with learning/communication difficulties and adults with aphasia.

6.1 **Aphasia**

Aphasia is a communication disability that affects the language system. It may be acquired following cerebral vascular accident (stroke), head injury, or other neurological condition, causing difficulties with comprehension, reading, spoken language and/or written communication. Guidelines have been developed by the Queensland University Aphasia Group, who have developed guidelines based on the W3C work specifically for this group of
users. This is essentially a summary of some of the issues raised by the more comprehensive W3C lists, and includes advice for dealing with visual impairment as well as cognitive issues. See:


a. Web content

- Keep the information as simple and concise as possible.
- Use short phrases and sentences, avoiding polysyllabic words.
- Use words which are in common usage rather than words which the reader would rarely come across.
- Where possible use bullets and numbers to create lists of hyperlinks, rather than embedding links in paragraphs of text.
- Accompany text with text equivalents, e.g. graphics, sound, photos and use “alt” (html) to add simple labels to images.
- Avoid animated graphics. They can be visually distracting.
- Where possible convert photos to thumbnails to minimize download time and to reduce the need to scroll through long pages.
- Minimum font size 14. Avoid use of bold font as it decreases readability.
- Font colour: where possible use black/dark blue font on white or pale coloured backgrounds. Avoid yellow font as older readers view text as though through a yellow filter. Very bright colours tend to blur at the edges, creating “after images” and eye fatigue.
- Background colour: To differentiate between different pages within a site, vary the colour of the backgrounds for each page.
- Background Font style: keep to the simple “easy to read” fonts. This may seem boring, but it will be easier on the reader.

Note—these guidelines do not include some important aspects such as making links as clear as possible, and also ‘front loading’ the text.

b. Formatting

- Use a one-column (or maximum 2 column with graphics) layout with generous margins on each side. A narrow reading column will lessen the load of reading long lines of text. White space also makes a page easier to read.
- Use of frames can clearly delineate sections of text and graphics. (note: this recommendation may not suit users of computers with slower internet connections).
- Label frames clearly.
- Use clear headings to break up page into more manageable content.
- Avoid use of distracting banners, advertising images and logos. A person with literacy disability may find this clutter detracts from their ability to locate and use the browser’s navigation toolbar.
Note that frame use needs to be used with care with people with visual impairments, and it is recommended that non-frame version of sites be provided.

c. Navigation elements

- Organise pages predictably with the navigation bar in the same place on each page.
- Maximum of 6 links in navigation bar. Use of buttons in addition to links if necessary.
- Use large buttons and links to facilitate mouse accuracy.
- Horizontal placement of navigation bar to leave maximum area for text and white space across table.
- Provide navigation mechanisms to assist orientation e.g. within page instructions, directions to previous/next page (text and non-text equivalent).
- Use internal links on Web pages to minimize scrolling through long pages of text. Keep it simple and provide instructions if necessary.

Some Web sites provide a “Text only” Web option: This accessibility option is not recommended for people with aphasia due to their reliance on graphics and photos to understand Web content.

Example Site - Queensland University Aphasia Group

Note the simple layout adopted for this site on aphasia. This involves the use of large font, non-use of text backgrounds, use of large images, and narrow columns of text. The downside to this is that it takes a lot of space in order to provide a small amount of information. In the Web site a scrolling bar has been implemented. This is probably not a good design option for use with inexperienced users, and a page-based interface might therefore be better.

6.2 Learning/Communication Difficulties

The Meldreth Manor School site is probably the best known Web site in this area, and promoted as a good example to follow. The emphasis is on providing a very simple to navigate site using very large buttons that incorporate icons as well as text. In addition to navigation functions requiring active selection, mouse rollover effects are also used to make some actions more simple. Sounds are also integrated into the site to give a truly multimedia feel to it.

Meldreth Manor School Site (http://members.tripod.com/MMSCHOOL2/)
The Meldreth Manor School site uses a small number of colourful images coupled with auditory icons to promote navigation. The site is designed to be visually appealing rather than containing large amounts of information. Some
use of animated graphics is used to add interest, and as already noted some active roll-over effects are used. Some of the design guidelines (from Banes and Walter, 2000) that have been used are:

- Use consistent and clear layouts for pages
- Avoid complex backgrounds (a simple white background is sufficient)
- Avoid the use of scrolling pages
- Ensure graphics have good alt text
- Optimise pages for fast downloading (avoiding large graphic files i.e. more than 15K)
- Provide symbol support for plain text
- Ensure extra access features are easily available
- Place navigation controls in a consistent place.

Banes and Walter also describe a range of additional techniques for improving Web accessibility. For example, the ACCESSKEY facility can be used to provide keyboard shortcuts, and in addition Javascript can be used to enhance access, e.g. by the use of mouseovers, autoscroll, timed page turning, etc. Simple advice is also provided for navigation, text and graphic links, the layout of tables, and the use of ALT tags. Advice is also given regarding file naming conventions, use of colour palettes and maximum file sizes for home (30K) and information pages (120K).

Some additional guidelines can also be inferred from looking at the Meldreth Manor sites. These would appear to be:

- Make the site as visually interesting as possible, using both static images and animation
- Provide a small number of menu items on each screen (no more than 6), using large icons to supplement text and ensuring that the screen does not become cluttered
- Use sound to confirm menu selection or to make the site interesting
- Consider using roll-over effects to allow some access by those unable to actively select items. Note this needs to be used with care as it is recommended by the Trace Center that Javascript not be relied upon to access pages, and that active input to access pages also be implemented. Banes and Walter also report that Javascript should not be relied upon to provide core functions, but this seems to be contravened in the Meldreth Manor site.
• Provide simple non frame based pages
• Do not rely on text to convey information

Note—The site also has to be set up for 1024 x 768 screen resolution to view properly, unlike most pages that can be read at 800 x 600. The Javascript used to implement button functionality could also make it difficult to use with a screen reader (See Appendix 3).

6.3 Dyslexia

The affects of dyslexia vary between individuals, but some of their difficulties are that:

• visually similar words may be confused (e.g. form/from, of/off)
• homophones are often confused (e.g. brake/break)
• common or short words may be misspelt, longer words may not be
• use of spell checkers can results in correct spelling, but wrong word
• the person is unlikely to be able to identify his or her own errors
• Writing may jump from one point to another, without explicit connections being made (Disability and Additional Needs Service, Loughborough University, 2004)

Some of the hints and tips from the British Dyslexia Association’s Dyslexia Style Guide are relevant to the design of Web sites and are paraphrased below (http://www.bda-dyslexia.org.uk/main/home/index.asp). This Guide describes how people with dyslexia read and process information differently and recommends simple changes to the way information is presented to them. Although many of these guidelines relate to text on paper, many can also be considered relevant to Web page documents. Also, many of the guidelines are good human factors recommendations that can be found in the strategies for reducing text complexity in WCAG 2.0, working draft, for example using lower case letters rather than capitals, using line spacing between paragraphs to break up text, not justifying the right edge, and using active rather than passive verbs.

Font Style
• Select sans serif fonts such as Arial, Comic Sans, Verdana, Helvetica, Tahoma, Trebuchet or Sassoon.
• Use 12pt or 14pt as a minimum size.

Presentation Style
• Limit lines to 60 to 70 characters. Lines that are too long or short can put strain on eyes.
• Use wide margins and headings, as well as short paragraphs.
• Use bold to highlight. Italics or underlining can make words look like then are running together.

• Use bullets or numbers instead of continuous prose.

Writing Style
• Keep sentences short and simple and down to an average of 15 to 20 words. Also, use short words wherever possible.

• Don’t start a new sentence at the end of a line, which makes it harder to follow.

Increasing accessibility
• Use flow charts for explaining procedures.

• Use pictograms and graphics to help to locate information.

• Use lists of 'do's and 'don'ts' which can be more useful than continuous text.

• Provide a glossary of abbreviations and jargon.

Text-reading software
• Use full stops after headings to make the voice pause and drop in tone (this conflicts with common practice, which suggests that full stops not be used after headings).

• Use semi-colons, commas, or full stops after bullet points in order to separate each point.

• Menu items should be numbered to aid navigation.

• Words in mid-line should not be written in capital letters, as they may be read as single letters.

• Include only signs/symbols that are absolutely necessary, e.g. asterisks or slashes, because these will be spoken by the screen reader.

• As screen readers read down each cell, use tables with care, and make sure that tables are summarised.

Website design
Since text is read 25% slower on a computer, consider the following:
• Provide a site map.

• Use graphics, images, and pictures to break up text, but bear in mind that they may take a long time to download.

• Large graphics make pages harder to read.
- Where possible design Web pages which can be downloaded and read off-line, as well as offering alternative download pages in a text-reader friendly format.

- Moving text creates problems for people with visual difficulties as well as for text-reading software.

- Provide hyperlinks at the end of sentences.

- Most users prefer dark print on a pale background, but make sure that it is possible for users to set their own choice of font style and size, and background and print colours.

The example below illustrates how the British Dyslexia Association provides such choices to the user. Its Web site offers users a choice of font type, size, colour, and background colour, along with alternative methods of portraying links, i.e. choosing colour, underlining or hover options (See Figure below).
Underlining hyperlinks (or any text) can make reading text difficult for some people, as the words look like they are running together. The AbilityNet site below (www.abilitynet.org.uk) uses spaced dashes as an underline instead, which might make reading the links easier for some users. It is interesting to note, however, that this technique is not used consistently throughout the entire site, which inconsistency may prove confusing to some users.
Another simple technique for providing choice of background colour is provided by the Dyscalculia and Dyslexia Interest Group (DDIG, at ddig.lboro.ac.uk). With the cursor hovering over the background colour grid (see Figure below), it is possible to visualise the preferred background colour to suit individual needs, thus enabling this colour to be chosen for the entire DDIG Web site.

This is an easy tool that could have wider application through supportive Web browser software. For example, the Layout Editor of the WWAAC browser could, for example, enable the user to see the change in background colours in a preview. Then the colour could be saved in the user’s preferences.

It is clear to see from all these existing guidelines and illustrations that there is much to learn from the needs of different user groups which can make the Internet easier to use for everyone.
Appendix 2

Text Complexity Measures

From: http://www.cultsock.ndirect.co.uk/MUHome/cshtml/index.html

Practical work: readability scores

You need to assess what level of English your audience are comfortable with and then ensure that whatever text you produce hits that level. To determine the level they are comfortable with, you can use a manual method called the Fog Index or computer software which will do it for you (it’s often built into wordprocessor software).

Fog Index

You should use several passages selected from your target audiences’ preferred texts. For each passage you need to proceed as follows:

5. Count 100 words from the beginning of the passage (hyphenated word = two words; abbreviation = 1 word)
6. Place a vertical line as a marker after the 100th word
7. Find the average length of the sentences in the passage:
   a. find the last full stop before the 100th word
   b. count the number of sentences up to that full stop = TS
      (sentences divided by colons or semi-colons are one sentence, however long)
   c. count the number of words between the full stop and the 100th word = NW
   d. TW = 100-NW
   e. the average sentence length (ASL) = TW/TS
8. Find the total number of words of 3 or more syllables in the 100 words (i.e. 'difficult words' (DW))
   ((2 (ASL+DW))/5) + 5 gives you the Fog readability score.

Scores:
{PRIVA<13 1:very easy
TE}
13 - 16 2:easy
17-20 3: quite difficult

Incidentally, you might well like to question the rather simplistic assumptions here. A similar system will underlie all computer-based checkers as well. One year, a student of mine chose a number of passages from James Joyce’s Ulysses just to see what would happen. As they all had short sentences and short words, the computer decided they were easy to understand - but they certainly weren’t!

Computer Software

If you have a version of Microsoft Word for Windows, you can use it to determine the readability level of text. You will need to enter several passages
of at least 100 words each selected from your target audiences’ preferred texts. Remember that you shouldn’t need to type it in by hand as your college should have OCR (optical character recognition software) available. If you are using Word 97, here’s how you do it (you'll find that other versions of Word are similar):

1. on the Tools menu, click Options;
2. click the Spelling and Grammar tab;
3. check Check Grammar with spelling;
4. check Show readability statistics;
5. run the spellcheck (as you go through the text, allow Word to correct spellings by all means, but you should be able to Ignore comments on grammar, unless it picks up a genuine mistake you missed, rather than an aspect of your style)

When you have completed the check, a message box will appear:

- Press Alt+Print Scrn
- Click OK
- Move the insertion point to the end of your document
- Press Ctrl+V
- Save the document
- You now have the document saved together with the readability statistics.

**Interpreting the statistics**

Some of this information is also taken from the British Dyslexia Association (www.bda-dyslexia.org.uk), and comparisons are made to show potential conflicts of scores.

Here is Microsoft’s interpretation of the scores, taken from the Word 97 Help file:

**Readability scores**
When Word finishes checking spelling and grammar, it can display information about the reading level of the document, including the following readability scores. Each readability score bases its rating on the average number of syllables per word and words per sentence.

**Flesch Reading Ease score**
Rates text on a 100-point scale; the higher the score, the easier it is to understand the document. For most standard documents, aim for a score of approximately 60 to 70. However, a score of approximately 70
to 80 is recommended for people with dyslexia, and this could probably also be applied to other user groups with communication or learning disabilities (British Dyslexia Association).

**Flesch-Kincaid Grade Level score**
Rates text on a U.S. grade-school level. For example, a score of 8.0 means that an eighth grader (13 year old) can understand the document. For most standard documents, aim for a score of approximately 7.0 to 8.0. However, a score of approximately 5.0 is recommended for people with dyslexia (British Dyslexia Association).
This means that by using short sentences, and not by dumbing down vocabulary, a fifth grader, i.e., a Year 6, average 10 year old, can understand the document.

In order to set the spell checker to automatically check the readability of text in Word, go to Tools, Options, Spelling, and Grammar, then select Readability request. The readability score will then be displayed every time a spell check is carried out. Regardless of the ‘meaning’ of the scores, you should be aiming to reach similar scores in the text you produce to that achieved by that of your audiences' preferred reading.

**Cloze Test**

After you have checked on some texts of your own that you are hitting the right level, you should take them out to some audience members and perform a Cloze Test on them:

4. Take a text of about 250 words of continuous prose.

5. Leave the first sentence intact.

6. Thereafter delete every fifth word, leaving a standard-size gap for each deleted word.

7. Leave the last sentence intact.

8. Number each gap.

9. Respondent fills in missing word for each gap.

10. Count up correct answers. Do not allow synonyms (you can if you want, but it rarely makes much difference to the final score and makes life more difficult for you).

Scores:

<table>
<thead>
<tr>
<th>{PRIVATE}</th>
<th>reader understands</th>
</tr>
</thead>
<tbody>
<tr>
<td>&gt;50%</td>
<td></td>
</tr>
<tr>
<td>35% - 50%</td>
<td>reader needs help</td>
</tr>
<tr>
<td>&lt;35%</td>
<td>frustration</td>
</tr>
</tbody>
</table>
Appendix 3

Example script from Meldreth Manor School Site

This script demonstrates that the Javascript used to implement button functionality would make this site difficult to use by a screen reader.

```html
<!DOCTYPE HTML PUBLIC "-//W3C//DTD HTML 3.2//EN">
<HTML>
<HEAD>
<TITLE>School choice page</TITLE>
<script language="JavaScript1.2">
<!--[if lteIE6]><style type="text/css">
@media all,
expression(all)
{quirks-mode: Quirks;}
</style><![endif]-->
/*
script written by Website Abstraction (www.wsabstract.com)
More free scripts here
*/
if (document.layers)
document.captureEvents(Event.KEYPRESS)
function backhome(e){
  var targeturl="rednose/red2.html"
  if (document.layers||document.getElementById&&!document.all)
  if (e.which==104||e.which==32)
    window.location=targeturl
  }else if (document.all){
    if (event.keyCode==104||event.keyCode==32)
      window.location=targeturl
  }
document.onkeypress=backhome

// preload next graphic

var new_image=new Image();
new_image.src="front.jpg";

//-->
</script>
```
Appendix 4

Alt-Representation – What the User Might See

- Starting with a page on BBCi...
  ![BBCi Page Screenshot]

- Introducing a direct text link to content, added by the web developer
  ![Direct Link Example]

- Looks for substantial content (headings, long sentences, no or few links)
  ![Long Content Example]

- Make link as high as possible in the source of the page
  ![High Link Source]

- Visible or transparent link?
• The Summary could be either of the entire website or a particular page – in this case it’s a page summary.

• All Web developers should be encouraged and enabled to provide simple page descriptions as meta data.

• The browser can show the summary in a pop-up window when the user selects the link.

• Closing the window returns you to the web page.
- The background could be greyed out to minimise visual distraction, or ...

- ...the Summary button could take you to a new page (similar to our WWAAC summary), with a simple way of returning to the original text.
- Using 16pt
Here the link is to an Alt Representation of the content.

When Web site is ‘concept coding enabled’ ...

Text and symbols would both appear in the summary.

Concept codes would retrieve correct symbol set and translate them for this user (here in Widgit Rebus).
The WWAAC project acknowledges with thanks permission by the BBC for the use of the ‘Eastenders’ Web site for research purposes.
Appendix 5

Survey on guidelines issues

Following a presentation on guidelines for an AAC-enabled Internet (Nicolle et al, 2004) at the 2nd Cambridge Workshop on Universal Access and Assistive Technology (CWUAAT), Fitzwilliam College, University of Cambridge, 22nd-24th March, 2004, a questionnaire was completed by 15 participants. Not all the respondents included their name or organisation, but their skills and expertise ranged from computer scientists, designers, engineers, industrial representatives, ergonomists and sociologists. With varying levels of expertise with AAC and Web accessibility, their opinions and comments have been included below, with a summary of key points in Section 6 of this document. It is interesting to note that in most cases replies on various issues were mixed and did not relate to the level of expertise in AAC or Web accessibility of the respondents. Not all of these issues have resulted in specific recommendations but are presented here to contribute to the debate.

1. Alternative Sites

Opinion is varied as to whether there should be one or two sites. When participants at the CWUAAT workshop were asked if there should be both an original site plus a text only/flashless, etc., site, or if there should be a single site more accessible to all, the replies were as follows:

9/15 respondents said there should be only 1 site.
6/15 respondents said there should be 2 sites.
1/15 respondent preferred 2 sites, but suggested 1 if possible.

Reasons given were:
A ‘design for all’ solution is not really possible, even if a ‘design for many’ is.
2 sites are also useful for people on dial-up.
May need 2 sites initially, moving to one site.
Definitely argue for a single site – if necessary with flash/non-flash sub-parts to ensure accessibility throughout if necessary. This is less burden on developers/maintainers of the Web site and makes users with disabilities feel more included.
A mix of both. The same site but different pages telling the same things in the same way, as pages in different languages do now.
Ideally 1 site. With modern content management, 2 sites are easy to maintain for big sites.
From a practical designer’s perspective.1 site is better.
One expert also suggested making the Easy Access site the main site and the complex site the one you opt into.

It would appear from these comments that, ideally, there should be one accessible site. However, if there is a second site, it must be updated as often as the original site. It is also suggested that a standard mechanism be
employed to tell the user that there is a more accessible version of the Web site. Techniques suggested in WCAG 1.0 are (see 4.3 in Appendix 1):

- To provide links at the top of both the main and alternative pages to allow a user to move back and forth between them, and
- Use meta information to designate alternative documents, so that the alternative page can be automatically loaded based on the user’s browser type and preferences.

Our survey also made the following suggestions for standardising this link to alternative pages:

Find a naming convention for the URL (like WAP pages for mobile phones usually start with ‘wap’ instead of ‘www’).
Provide a meaningful image.
Text link, first item on page.
Use language tag.
Single opening page with two options.
Easy access here.
Text version.
Call it personalisation/customisation. This is what companies want to do anyway.
Opening of home page (combined with automatic browser capability detection)

These various options still need to be discussed further, but would provide some possibilities for WAI to consider.

2. **Summaries of Content – Page or Site**

In our quick survey, participants were asked at what level they thought the summary should be: at the page level or at the site level.

6 experts said at the page level, and 3 said at the site level. 5 experts said the summary should be at the site and page level, with one of those saying ‘as appropriate.’

From this diverse opinion, the WWAAC project would recommend that the Home Page of the Web site gives a summary of the whole site, and the other pages give a summary of each individual page.

3. **Tagging Images**

In our mini-survey, experts were asked the following questions:
In developing a markup language for images, what should the categories be (e.g. background, decorative, advertising . . .)? In an ideal world, what would be useful for end users, and especially users with communication needs? The following categories were provided from different respondents:
Background (although these images are embedded differently in HTML, so browsers can differentiate these anyway)

Key content
Illustration / technical
Decorations (also things like bullets in lists)
Advertisements (consider pop-ups)
Images directly related to the text
Images not directly related to the text
Graphic (non-essential)
Animation
Video
Product item, etc. (different tags for transactional sites). Divide tags into transactional, informational, entertainment.

Other comments/suggestions:
Non-content images (e.g. spacers) are already marked up with ALT * and Web browser/screen readers should render this properly.
All the rest leave as IMG clients.
Only tag those with useful content.

It was also suggested that a ranking similar to Nielsen’s ranking of usability problems in heuristic evaluation be used:
1 = vital for understanding the content of this page.
2 = important for understanding the content of this page
3 = relatively unimportant for understanding the content of this page.
4 = cosmetic only
5 = third part material, inc. advertising.

One expert also pointed out that the weakness of tagging images is that the tag is designer-specified, and the user’s opinion or definition may be different. It was also suggested that Web developers would need some kind of template to know what the categories are.

Experts were also asked whether they thought that advertisers would want priority when tagging their images, and if so, should we bother even suggesting this. Opinions varied, but the following replies were given:

What about the legal situation. What are the rights of the advertisers? (anyway, turning off advertising would be great . . . )
Not necessarily. Advertisers should know that irritating adverts are counter-productive.
Yes, Yes, Can we get a button to turn advertising off.
But many Web pages don’t have advertising.
No, they won’t but then content differentiated. Don’t bother suggesting it.
Would user be able to set preference? To ignore images tagged as ‘advertising’?
I believe so (to suggest tagging advertiser’s images)
You can already get ad blocking software, so maybe this won’t scare them.
Yep! We all get annoyed by ads but have to accept them.
Add an equivalent to a “please visit our sponsors’ pages”

These comments and suggestions still need to be considered further, but could provide some useful options for WAI to consider.

4. Navigation mechanisms

Skip-to-Content
In our mini-survey, experts were asked if they thought it is a good general design principle to have a ‘skip to content’ link at the top of the page when there are already a number of links there. Out of 13 replies, 10 gave a positive response, with some reservations and comments as provided below:

- Difficult to say, it depends whether the user visits the page the first time or if he is already familiar with it.
- N/A. Use style sheets.
- Yes, inserted implicitly by a number of browsers already.
- Yes, useful to numerous users. Could be a link only accessible to screenreaders, other assistive technology.
- Yes, although it is better to use Cascading Style Sheets (CSS) to allow the main content to come first in the HTML.
- Essential.
- This could cause confusion for the user.
- Why not just have ‘Content’
- Yes in principle, but might get repetitive.

Experts were also asked if the ‘skip to content’ link should be transparent. Out of 7 replies: 5 gave a fairly positive response, with some reservations and comments as provided below:

- Not vital (to be transparent), but certainly acceptable.
- Probably (transparent), otherwise you have to have another link on the page, which increases confusion/difficulty.
- Not necessarily (transparent), e.g. Visitor using both text-to-speech and text highlighting.

One expert suggested putting a hidden tag in the page which says “the content starts here” and which the user could just scroll to. When our mini-survey asked other experts what they thought of this idea, out of 11 replies, 7 gave a positive response, with some reservations and comments as provided below:

- Not sure it is necessary.
- Could be interesting.
- Less satisfactory solution to the problem. You need to search for this.
- Could be useful confirmation that user is in correct location.
- Could be useful with some screen readers.
- Yes, similarly label the ‘links’ sections.

Experts were also asked how they would like to navigate to Alternative Content or Representation of the content (e.g., separate Web page, in-page hidden content, etc.)? The following replies were given:
In-page hidden content, if well designed and consistent (not really hidden but transparent, what any given browser is able to render (3 experts).

Hidden tags that point to separate pages.

Provide a meaningful image.

Use of style sheets, the concept of a virtual device for AAC users, parallel to portable devices, etc. If not possible, in-page hidden content.

Use existing HTML 4 features to provide alternative content (ALT, LONGDESC, TITLE) and leave it to the browser to present it. Give control to the user. I (a sighted user) won’t want to see your accessible content: let me turn it off.

Open new page within browser.

Separate page (on the assumption pages will be smaller and hence faster to download).

All representations of content should be treated equally. The AAC version should not be considered a ‘secondary’ version.

**Skip-to-Links**

When experts were asked if they thought it was a good general design principle to have a ‘skip to links’ link, out of 11 replies, 7 gave a positive response, with some reservations and comments as provided below:

Depends on the design of the site.

What about using frames in a principled way. Label one frame ‘links/navigation frame’, ‘(main) content frame’.

Would provide user choice.

Why not just ‘Links’,

Experts were also asked the following question: If limiting the number of links on a page, what is a reasonable number of links to recommend?

The replies ranged from 5, 5 +/- 2, 7 +/- 2, ~10.

Other comments included:

Impossible to determine.

Certainly less than many pages have now

Impossible to say, depends on how the links are structured.

Variable: the importance of the links should determine their number and position in what is effectively a list.

Depends. Very many Web pages are far too cluttered.

It would seem sensible to suggest no more than 10-12 links on a page. If this number were chosen, then they could easily be associated with the numerical or function keys on the keyboard to provide another method of navigating through them.
Appendix 6

Update of Co-operation with W3C–WAI

In November 2002, an extra Internal Deliverable No. 6a was prepared describing the WWAAC Project’s co-operation with the W3C–WAI. This document described:

- The WWAAC project’s membership and contributions to the WCAG Working Group
- WWAAC project’s Consortium Meeting with Wendy Chisholm from the W3C–WAI, held at the ACE Centre Advisory Trust, Oxford, on 27 June 2002.
- Face-to-face meeting, in Linz, Austria, 15-16 July 2002, to discuss current issues and work on testability and technical documents.
- Comments on Working Drafts of the W3C–WAI Web Content Accessibility Guidelines 2.0

The input from these activities was discussed in detail at the WWAAC Consortium meeting in Odense, Denmark (August 2002) where priorities for further actions were decided. Since the delivery of Internal Deliverable No. 6a, the following activities have taken place, all of which help to ensure that the specific user groups targeted in the WWAAC project are not seen in isolation, and that their needs are included in the development of the WAI guidelines.

**Telephone conferences**

The WWAAC project’s representative on the WCAG Working Group, Bengt Farre, has participated in regular telephone conference calls and emails when issues arose.

**WCAG WG face-to-face meeting in Venice, Italy**

(Report by Bengt Farre)

This meeting was held in Venice, Italy, 1-2 July, 2003, and attended by Andy Judson and Bengt Farre from the WWAAC project.

**Tuesday, 1st July 2003**

The morning was used for plenary discussions on WCAG 2.0 conformance and how to migrate from WCAG 1.0 to 2.0 and also how to test for conformance. During the afternoon the meeting was divided into small groups to discuss WCAG 1.0 and 2.0 and how they were applied to our respective countries. The reports from these groups were discussed during the last
section of the day. Some of these reports were uplifting and some were disappointing. IWA–Italy has for instance submitted the WCAG as a proposal for law, whereas other countries in Europe are waiting for the EU to act on their behalf. Other information about Sweden was that there was a report published just a few days earlier that most government sites were inaccessible.

Note:
Different countries’ perspectives: http://lists.w3.org/Archives/Public/w3c-wai-gl/2003JulSep/0014.html

WWAAC meeting
During one of the breaks in the meeting a small group of people joined in the discussion on the WWAAC project and mostly on how to implement the Concept Coding Framework (CCF) and use different technologies. The input from Charles is always interesting. We had a very lively discussion on different issues with what CCF should do and how it should do it. Participants were Lisa Seeman, Bengt Farre, Andy Judson, Charles McCathieNevile (W3C).

The conclusions from this meeting were that according to the use of different techniques of the W3C we are on the right track. There were a few suggestions about the logistics and implementation:
To accommodate both mail formats and docformats, we should stick to XML compliance. W3C does not really define anything about mail. Our discussion focused on where the RDF that was referring to concepts should reside, inside the (X)HTML document or just be associated with it somehow. The conclusion was that to be able to support most formats the RDF should be associated with the document rather than sticking it inside the document. This greatly improved our view on how things were to be done logistically. This is also the way one has to do it for Email purposes and having the same mechanics greatly reduces the amount of different code that has to be produced.

For HTML (XHTML) documents the solution was then easy: within the META tags a link to an RDF document that connects it to the CCF repository of concepts and representations, and within the RDF xpointers that point back to words in the HTML document and linking them to their concepts.
For Mail the solution was that Multipart/Related format would actually be the MIME component that was best suited to host both a document and its associated RDF document.

Wednesday, 2nd July 2003
The discussions continued with reports on different countries’ perspectives on WCAG and how to implement them.
After lunch discussion continued with techniques and open issues on WCAG 2.0.

Note:
Things being looked for in WCAG 2.0: http://lists.w3.org/Archives/Public/w3c-wai-gl/2003JulSep/0013.html

After the meeting we continued our discussion on WWAAC CCF applicability on the guidelines with the attendees, Andy, Bengt and Charles.

**W3C–WAI meeting of the Web Accessibility Evaluation Exchange, Dublin (Report by Colette Nicolle)**

This meeting was held at University College Dublin, 4 September 2003, during at the end of the AAATE Conference, and attended by Colette Nicolle and Bengt Farre from the WWAAC project.

Judy Brewer, Director of the Web Accessibility Initiative, provided an overview of evaluating Web sites for accessibility and how this concept fits into the WAI working group structure, in particular the Evaluation and Repair Tools working group. The ‘Evaluation Resource Suite’ first includes a Preliminary Review, which is non-technical and should not take more than 15 minutes or so (although this timescale needs to be discussed as to whether it is truly viable). This would be followed by a full Conformance Evaluation, which could take up to a week or so on a full site. It was suggested that more automated tools were needed. In addition, as part of the conformance evaluation, usability testing of accessibility features was needed, and the WAI would like to expand this section of their Evaluation Resource Suite.

Shadi Abou-Zahra of the WAI presented the Evaluation and Report Language (EARL), a general-purpose language for expressing test results (http://www.w3.org/TR/EARL10/), as well as a description of existing tools for accessibility evaluation and repair of Web sites (www.w3.org/wai/er/existingtools). These include:

**Evaluation Tools:**
- Local vs. remote
- General vs. focused

**Repair Tools:**
- Stand-alone vs. plug-in
- General vs. focused

**Transformation tools:**
- Local vs. remote
- Filter or converter

It was suggested that a tool was needed by developers that covers more points in order to promote standards harmonisation. A User Extendable Tool was also mentioned.

Shaun Lawton Henry from the WAI discussed usability testing of accessibility features and made the distinction between ‘technical accessibility’ and ‘usable accessibility.’ She suggested that whenever feasible, it was good to bring
‘accessibility people’ together with ‘usability people.’ She introduced the WAI Website Benchmark Usability Test Plan (Draft), and the Accessibility in User Centred Design (working draft) (see www.UIAccess.com). Interesting discussions took place on usability in the context of accessibility (number of users to include in an evaluation; recruiting users; care not to skew the data; types of questions that can be used with both disabled people and non-disabled people; tasks that can be performed by both, although the setup and goals may be a bit different).

Some other evaluation methods for testing Web accessibility were presented. BrailleNet (www.braillenet.org) uses an expert-centred approach, using what they call AccessiWeb experts, who have been given 5 days’ training. This team of experts includes an ergonomist, a technical expert and a user (usually someone with a visual impairment). Selecting 10-30 Web pages, the experts first conduct a preliminary review, then a more comprehensive review using AccessiWeb criteria, covering both accessibility and usability issues. A different or overlapping list of criteria is used by each of the experts, and an evaluation report is prepared. There is no automatic report tool. Separate accessibility and usability criteria clearly need to be used, and this was emphasised by the following example: a link may have the right code and therefore is ‘accessible’, but if there are 700 links on the page it won’t be ‘usable.’

Another example is the work done by the Bartimeus Accessibility Foundation in the Netherlands (www.accessibility.nl and www.design4all.org). Their protocol begins with a quick scan ‘no’ approach to identify major problems, and then usability testing is conducted by elderly people and people with disability, taking the ‘user friendliness’ items from WCAG priority 1, 2 and 3. Reviewers receive knowledge and awareness over 2 days’ training.

Jon Dodd from Bunnyfoot Universality described a method of evaluating Web accessibility and usability by using video and an eye-tracking system (developed by Tobii in Sweden). The demonstration also emphasised that body language and both verbal and non-verbal information need to be captured and can provide valuable information from users.

Large scale evaluation studies were also discussed, in particular the one by RINCE at Dublin City University (eAccess.rince.ie). It was considered a ‘cheap and nasty’ but still very worthwhile evaluation per site because of the large number of sites under consideration in this study (250 sites with results from 60% of them). Suggestions for the future included the possibility of tracking changes in the evaluated site over time and automating the testing.

In the presentation from François Junique of the EU Commission, he emphasised that the EU is committed to the accessibility of public Web sites and their content and to the definition of a common EU methodology for assessing progress of public Web sites in Europe. The goal is to monitor and report to decision makers including the European Council and the EU Parliament.
Finally, Judy Brewer presented further ideas on cross-disability usability testing of accessibility features. She wished to counter the myths that testing by blind users is sufficient to discover the potential usability failures of the site, the myth that a text-only alternative site is adequate; the myth that all one needs to do is identify a disabled relative (‘my uncle is deaf and he said that our Web site is fine’). It’s necessary to find and work with different disabled representatives and be willing to cross political boundaries.

The WAI is seeking to increase the quality and consistency of expert evaluations of Web sites, and are proposing a certain number of evaluations to be coached/mentored by expert evaluators. At the moment this idea is just being discussed, but may lead to volunteers evaluating a site for accessibility/usability problems, and writing up a report to be compared to other reports. This would hope to lead to further WAI guidance for more consistent and high quality Web evaluations.

**WCAG WG face-to-face meeting in Shin-Yokohama, Japan**
(Report by Bengt Farre)

**Background**
This meeting was held in Shin-Yokohama, Japan, 21-22 November, 2003. The JIS (Japan Industrial Standard) is also working on a set of guidelines (JIS_X8341-3) that would apply to the work of the WCAG. The meeting was with individuals from JIS so it was not a formal meeting. Wendy Chisholm had spent time before the meeting going over the JIS proposal to identify parts to be addressed by the WCAG.

There are different issues in different countries, and some specific issues in Japan. Some of these issues seem to be directly applicable to the Concept Coding Framework (CCF) in that there is a semantic symbol with different sound representations and vice versa. Kanji are semantic characters, and Katakana and Hiragana are phonetic, with 1006 Kanji characters after elementary school, and 1935 characters used in everyday language. Vision impairment is an important issue with the fine grained detail of Kanji.

There are 2 ways of writing vertically and horizontally. On the web, where support for vertical writing is not available, a column of characters is made with new lines between them, which cannot be dealt with by voice browsers / screen readers.
Kanji can have several pronunciations in different contexts.
Different symbols (shapes) are part of everyday text: circle means ok or that trains have empty seats. Vertical text in images need text equivalents.
Even spaces inside words, which are used to make titles the same width, is a problem for screen readers.

Hiragana and Katakana are easier to read, and 100% perfect translation is impossible to Kanji without context.
Foreign words are imported into Japanese - uses Katakana.
Even though Ruby is available to solve some of these issues, this has only been used for person-names.

*Friday, 21 November, 2003*
On the first day of the meeting, it was identified that WCAG 1.0 did not address some of the issues for Japan. The focus of discussion went on to areas where JIS and WCAG differed.

Shapes are used in Japan as part of ordinary text, but are not addressed by the WCAG. Sometimes shapes are used to enhance chapters, headings and such. In 6.9c of the JIS X8341-3, it says: For words that have a difficult reading, it is desirable to add Hiragana or Katakana to make the reading clear (for which there is no equivalent in WCAG 1.0 or 2.0.)

Discussion went on to implementation testing of WCAG 2.0, developing tools and such. This was a discussion of techniques and guidelines. Afterwards the JIS discussion continued. "Graphical symbols should not be overused. If they have to be used, attach information of their meaning and their pronunciation" - graphical symbol examples are circles and stars, used for bullets among other things. English fonts don't have these characters, so for English, images are usually used for these. Japanese fonts have hundreds of these characters in them. Sometimes they are used to add structure to text e.g. 4 stars = heading.

This seems to be an issue because structure of documents in Japan is different from others, and there are no standards that contain those structures so they have to be made by hand. Actions were assigned to Charles and Max to take these issues further.

These discussions were on a pre-release of the JIS Web content accessibility guidelines.

*Saturday, 22 November, 2003*
During the Saturday meeting most work was concentrated on WCAG 1.0 and 2.0. The following discussions took place:
Discussions on technology-specific requirements should go to techniques documents.
Discussions on different levels applies to the guidelines and how the success criteria should follow.
Discussions on U.S Access Board process for defining Section 508 web standards.
Discussion about the need to provide both a text label and a text description for non-text content that is designed to create specific sensory experience.

*Conclusions*
In the WWAAC project, we adopted Ruby (W3C format) to allow us to have both symbols and text and let a screenreader read the continuous text without resorting to tables or other means that would mean a large issue with screenreaders. WWAAC has focused on attaching information to symbols/text. The Concept Coding Framework (CCF) would be such a tool to add information to different kinds of concepts and representations.
WCAG WG face-to-face meeting at CSUN
(Report by Andy Judson)

WAI-WCAG face-to-face meeting, held at CSUN (California State University Northridge, 19th International Conference, Technology and Persons with Disabilities, 15-20 March 2004, Los Angelos.

The focus of this meeting was how WCAG are going to get to candidate recommendation. The discussion was around the amount of work to be done and the processes to be completed. The focus of this meeting was not the actual WCAG guidelines, though some discussion was centred around the mapping of the techniques to the guidelines and also how well all the various kinds of disabilities are represented. We stated that the AAC user’s disability when using the web is no longer speech impairment but focuses back to the learning/cognitive disability. This is one of (if not) the hardest to accommodate, and the guidelines have certainly started to address this. Hopefully, the current concept coding work will generate more advances for these users. Thus, the concept coding work should be (and is meant to be) part of the techniques work. There was also a very interesting discussion on the Japanese (jis) guidelines and their specific issues - this is similar to some of the problems faced and addressed by concept coding.

The majority of the discussion centred around conformance claims. This was a very interesting discussion and several points from both sides of the debate were clearly valid. It soon became clear that no matter what route is taken, we'll never accommodate everyone. But, what makes this tricky, is that one of the attendees (an ISP) said that if they have to conform to WCAG 2.0 level A for legal reasons, and they can automate these tests, then they might (and it must be stressed that he was speculating) have to try and affect the legal implementation of the guidelines by the various countries.

During this meeting, it was made clear that WWAAC partners are keen to continue doing work in the WCAG Working Group (within and beyond the scope of WWAAC) and to help with the development and evaluation of test implementation of the techniques and guidelines.