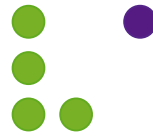




**Australian Government**  
**Department of Finance  
and Deregulation**



**vision  
australia**

blindness and low vision services

# The Australian Government's study into the Accessibility of the Portable Document Format for people with a disability



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Australian Government Information Management Office  
Department of Finance and Deregulation  
John Gorton Building  
King Edward Terrace Parkes ACT 2600  
Email: [WCAG2@finance.gov.au](mailto:WCAG2@finance.gov.au)

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one Executive Summary



one

## one Executive summary

People with disabilities face challenges in dealing with the online world. In order to participate in the online world they employ many adaptive strategies and use a range of tools commonly known as assistive technologies. These include text to speech software and screen magnifiers to name a few. The way information is presented online by government and others can make it difficult for assistive technology to do what it needs to. Many technologies have accessibility issues but the Portable Document Format (PDF) is the one most often the subject of web accessibility complaints.

The Australian Human Rights Commission (AHRC) considers Portable Document Format (PDF) files to be generally inaccessible to people with a disability. Since 2000, the AHRC has maintained this strong position and their *Disability Discrimination Act: Advisory Notes* recommend alternatives be provided when PDF files are used<sup>1</sup>. To date, the Australian Government has supported this position.

Internationally, perspectives on the accessibility of PDF files are unclear and there is no agreed definition about what constitutes an 'accessible PDF'. Notwithstanding this, technical advances in the Portable Document Format and improvements in the assistive technologies used by people with a disability are having a major impact on the policy debate.

The Australian Government's recent endorsement of the World Wide Web Consortium's (W3C) *Web Content Accessibility Guidelines* (WCAG) version 2.0 provides a renewed commitment by the Government to web accessibility. To enable the Government to conform to WCAG 2.0 and meet its obligations, particularly in relation to the *Disability Discrimination Act 1992 (Cwlth)* (DDA) and the *United Nations Convention on the Rights of Persons with Disabilities* (UNCRPD), a clearer understanding of the implications of using PDF files is required.

It is clear that there is a need for a greater understanding of the way PDF files are accessed by commonly used assistive technologies and the implications in using the Portable Document Format, via various adaptive strategies, by people with a disability.

To address the need for greater clarity on the issue, Vision Australia was commissioned by the Australian Government to undertake this study (the Study). It included a series of user consultations to understand the situational context in using PDF files, followed by technical evaluations assessing the functionality of the most commonly used assistive technologies when interacting with PDF files. The outcome of the consultation and results of the technical evaluations were then tested by people with a disability employing various adaptive strategies to gain an understanding of their experience when interacting with a selection of PDF documents.

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<sup>1</sup> Australian Human Rights Commission, 2009, *World Wide Web Access: Disability Discrimination Act Advisory Notes*, viewed 5 April 2010, [http://www.hreoc.gov.au/disability\\_rights/standards/www\\_3/www\\_3.html](http://www.hreoc.gov.au/disability_rights/standards/www_3/www_3.html).

It is important to note that accessibility is largely based on situational context. The Study showed there are a number of drawbacks in relying on technical evaluations as the sole determinant of accessibility. While technical evaluation might indicate a product is accessible, the user's experience in whether they can achieve their specified goals with effectiveness, efficiency and satisfaction is the most important measure of accessibility.

Overall, the Study found that there is **insufficient evidence to establish that the development of the Portable Document Format and improvements in assistive technologies have advanced enough for PDF files to be considered accessible for people with a disability**, particularly for those who are blind or have low vision.

Importantly, the Study also highlighted that **the issues contributing to the inaccessibility of PDF files, when used with assistive technologies, are not in general directly attributable to the Portable Document Format itself**. The issues that result in an inaccessible PDF file are, in order of impact:

- **the design of the PDF file** by the document author to incorporate the correct presentation, structure, tags and elements that maximise accessibility;
- **the technical ability of the assistive technology** to interact with the PDF file (via the relevant PDF Reader); and
- **the skill of the user** and their familiarity with using their assistive technology to interact with a PDF file.

It should be noted that **access to information in any file format, not only PDF, is significantly diminished for assistive technology users if there is no consideration given to these three issues**. This Study focused solely on the Portable Document Format as this format is most often the subject of web accessibility complaints.

Furthermore, other than WCAG 2.0 Success Criteria, the Study could not identify an agreed definition on what constitutes an accessible PDF file to enable its accessibility across a wide range of assistive technologies. While the Study identified a body of work being undertaken to establish a set of guidelines for the creation of accessible PDF files by the PDF Universal Access Committee (PDF/UA), the guideline is in draft and not due for release until at least 2011.

As the Government recently endorsed WCAG 2.0, the Study used a number of WCAG 2.0 Success Criteria in the technical evaluations to determine if the use of PDF files with assistive technologies could claim conformance against the Guidelines. Until further data is available on the characteristics of an accessible PDF file and there are Sufficient Techniques available to support the conformance of the PDF technology to WCAG 2.0, **the Australian Government position recommending that alternative file formats be provided whenever PDF files are used should remain unchanged**.

# Key findings

## ***User consultations (Vision Australia)***

- PDF files are used by a wide variety of organisations and are commonly encountered. People who are blind or have low vision experience a high number of problems when accessing and interacting with PDF files, particularly with PDF files using multi-column designs;
- Users did not understand the need or reason for information to be provided in PDF, particularly given the difficulties they experience using these files (i.e. supplying newsletters in PDF files was considered unnecessary);
- Users have no way of knowing if a file had been created in an accessible way before downloading and opening it;
- Screen readers are unable to interact with a document saved as an image only PDF file because images are not accessible to people who are blind. Poor quality scanned documents are also inaccessible to users who have low vision, as the ability to view and read a scanned PDF deteriorates when magnified;
- To overcome problems using PDF files, a range of alternate methods are often employed, all of which require additional software, more time and extra effort and often have limited success;
- Employing workaround methods to access inaccessible PDF files results in a degraded experience when compared to accessing equivalent documents in other formats; and
- PDF support in some assistive technologies was perceived as nonexistent (Braille Notetakers and DAISY player).

## ***Public online consultation (AGIMO)***

- 80% of respondents do not support the use of PDF files without alternate formats;
- Submissions made by people working in the field of web accessibility provide conditional support for the use of PDF files providing they are used appropriately, created accessibly and properly tested;
- Government submissions revealed that the use of PDF files was prolific and not always appropriate, but noted the Portable Document Format was still preferred over other formats;
- Misinformation about the accessibility of the Portable Document Format exists and there is a significant lack of awareness on:
  - when it is appropriate to use the Portable Document Format;
  - how to author or create more accessible PDF documents;
  - how to validate the accessibility of a PDF file; and
  - the impact that poorly created PDF files have on people trying to access them.
- There is a need for updated, specific guidance on the use of PDF files and how to create them more accessibly;
- The responsibility of document creators to consider accessibility was a strong theme in most submissions; and
- The importance of the user experience confirmed the critical role that user testing must play in the development of accessible web content.

## **Technical evaluation**

### **Common assistive technologies**

- Limited statistical data is available about the number of people using assistive technologies, and the type and versions they are using;
- The number of assistive technology users in Australia reported is relatively low compared to the number of people who are blind or have low vision;
- Vendors and disability organisations indicate that ZoomText is the most commonly used screen magnification software and JAWS is the most commonly used screen reader;
- The usage of portable Braille Notetakers (BrailleNote and PAC Mate) is relatively low; and
- Australian and international research shows the emergence of several free or low-cost screen reader options (NVDA, VoiceOver and SATOGO) that are starting to penetrate the market.

### **Vendor support**

- Most vendors claimed to provide support or functionality in line with other formats (e.g. HTML or Microsoft Word);
- Assistive technology development is guided by emerging technologies and industry trends, and the core focus for research and development is now moving towards Web 2.0, Accessible Rich Internet Applications (ARIA and HTML 5);
- Most vendors felt that the responsibility for PDF accessibility lies with document authors;
- More accessible PDF files are required before vendors justify further research and development time for PDF over other emerging technologies;
- Adobe Reader is the most commonly-used PDF reader; developments to this application have enabled better support for assistive technologies ; and
- Support for PDF files was limited in earlier versions of assistive technologies (e.g. prior to JAWS version 8).

### **Technical evaluation**

- The limitations of assistive technologies in interacting with PDF files, were not well documented prior to this Study;
- Based upon the Adobe Test Suite evaluation and statements provided by vendors :
  - 33% of the most common assistive technologies used in Australia provide sufficient technical capability to interact with a PDF file (demonstrated through technical testing and vendors claims); these assistive technologies are JAWS, MAGic and ZoomText; it is estimated that these products are used by 89% of the assistive technology user population; and
  - 66% of the most common assistive technologies used in Australia provide partially sufficient or not sufficient technical capability to interact with a PDF file (i.e. partially or completely failed technical testing); these assistive technologies are PAC Mate, BrailleNote, NVDA, SATOGO, Voice Over and Window-Eyes; it is estimated that these products are used by 11% of the user population;
- Of the assistive technologies that provided sufficient technical capability, JAWS (version 8 onward), was the only screen reader that successfully completed technical testing;

- The magnification component of ZoomText (versions 8 & 9) and MAGic (versions 9.5 – 11) provided sufficient technical capability based upon the Adobe Test Suite evaluation and vendor statements;
- No portable assistive technology devices commonly used in Australia currently provide sufficient support for PDF files; and
- As at August 2010, there are no Sufficient Techniques available for the Portable Document Format to support WCAG 2.0 conformance.

### ***User evaluations***

- PDF files that have been optimised for accessibility provide an enhanced user experience;
- Assistive technologies that provided sufficient technical capability (in interacting with a PDF file) still present usability issues that impact on a user's ability to interact with PDF files;
- Issues encountered by the participants during the user experience were not, in general, directly related to the Portable Document Format itself. The issues that result in an inaccessible PDF file are, in order of impact: the design of the PDF file, the technical ability of the assistive technology, and the skill of the user;
- Participants achieved a 90% success rate for tasks completed on the documents optimised for accessibility (collection A) and a 60% success rate for tasks completed on PDF files representative of government documents (collection B);
- The time taken to complete the tasks was more acceptable when using the documents optimised for accessibility;
- People who are blind and use screen readers experience the greatest difficulty in accessing and interacting with PDF files and this group also experienced on average, a higher number of issues compared to all the other disability groups; and
- Some functionality provided by JAWS for other formats was not available for the Portable Document Format, e.g. users were unable to navigate the PDF files by paragraph.

### ***Conclusions***

The findings of the Study raise the need for:

- An updated position on the use of PDF files on government websites; including a review of the use of PDF files when the PDF/UA standard is released and Sufficient Techniques become available to satisfy WCAG 2.0 conformance;
- An internationally-agreed position on the characteristics a PDF file must have for optimal accessibility and a transparent indication of the time and skill required to create such files;
- A study into the impact (cost and resource implications) in creating accessible PDF files;
- Better resources and tools to support people in the creation of accessible PDF files, including clear and centralised guidance for government agencies on:
  - appropriate use of the Portable Document Format;
  - how to optimise PDF files for greater accessibility;
  - the importance of testing PDF files for accessibility;

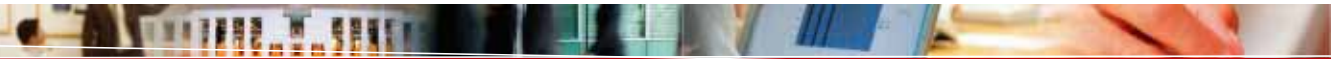
- Education programs, for authors and publishers of government documents, that include:
  - the impact of inaccessible web content on people with a disability;
  - information about assistive technologies and how they are used;
  - advice on how to author documents for online publication; and
- Government agencies to:
  - examine their use of PDF documents;
  - examine their workflow process in the creation of PDF files;
  - continue to offer a choice of file formats.

The Australian Government's *Web Accessibility National Transition Strategy* (NTS), released in June 2010, addresses many of the conclusions raised in this Study. The NTS sets out a 4 year work plan for the transition to and adoption of WCAG 2.0. In implementing the NTS governments agencies will need to ensure that the technologies and file formats in use on their websites conform to WCAG 2.0.

The NTS work plan specifically addresses electronic publishing processes, training and education about accessibility issues.

Supporting the Government's implementation of the NTS, AGIMO are providing resources, advice and guidance for government organisations on its [Web Publishing Guide](#). Complementing the Guide, AGIMO hosts a collaborative community of expertise for people to share their expertise about accessibility and discuss issues. The accessibility of PDF files with assistive technologies will become a dedicated topic of discussion and guidance following the release of this Study.

## two Introduction



two

## two Introduction

Accessibility, as defined by the International Standards Organization (ISO), is “*the usability of a product, service, environment, or facility by people with the widest range of capabilities*”<sup>2</sup>. In discussing accessibility we cannot ignore the concept of usability. The standard definition is “*the extent to which a product can be used to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use*”<sup>3</sup>. The concept of web accessibility was propagated by the W3C with their publication of the initial WCAG version 1.0. The Australian Government has recently endorsed the updated web standard and requires all government websites to comply with WCAG 2.0<sup>4</sup>.

Accessible websites provide all people with improved opportunity to access content to an equal or equivalent degree, as well as perceive, understand, navigate and interact with the web. However, web accessibility is contextual and many barriers exist to prohibit or limit a person’s ability to perceive, understand or operate web content. These might include visual, auditory, physical, speech, cognitive and/or neurological disabilities as well as situational contexts, the software platform chosen and the user’s level of skill.

While website accessibility is generally focused on improving information and services for people with a disability, it has broader application and benefits to all people. This Study deals with the PDF file type (ISO 32000) originally developed by Adobe. It is widely used for making documents available on web pages and for distributing documents in electronic format.

There is significant debate about whether PDF files are accessible to people with a disability. In the Australian context, the AHRC has maintained a strong position that the use of PDF files may present difficulties for people with a disability further recommending that alternatives be provided when PDF files are used.

In order to address the debate about whether PDF files are accessible to people with a disability, Vision Australia was commissioned by the Australian Government to undertake a study to determine the accessibility of PDF files for people with a disability, with particular reference to those who are blind or have low vision. The Study was conducted in three phases:

- **Phase one** involved a series of *user consultations*, with people who are blind or have low vision, to establish the specific issues and experiences using PDF files. The Australian Government Information Management Office (AGIMO) also conducted a public online consultation inviting submissions on the accessibility of PDF files in parallel with this activity.

<sup>2</sup> International Standards Organization, 2008, *ISO/TS 16071:2003 – Ergonomics of human-system interaction – Guidance on accessibility for human-computer interfaces*, viewed 5 April 2010, [http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=30858](http://www.iso.org/iso/catalogue_detail.htm?csnumber=30858).

<sup>3</sup> International Standards Organization, 2008, *ISO 9241-11:1998 – Ergonomic requirements for office work with visual display terminals (VDTs) – Part 11: Guidance on usability*, viewed 6 April 2010, [http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=16883](http://www.iso.org/iso/catalogue_detail.htm?csnumber=16883).

<sup>4</sup> Australian Government Information Management Office, 2010, *Web Accessibility National Transition Strategy*, viewed 1 July 2010, <http://www.finance.gov.au/publications/wcag-2-implementation/index.html>.

- **Phase two** focused on *technical evaluations* of the most common assistive technologies used in Australia by people who are blind or have low vision. It identified the common assistive technologies used and tested those identified against WCAG 2.0 Success Criteria. Its purpose was to establish whether the assistive technologies have the technical capability to interact with the structural information provided by PDF files and to determine if PDF files can be classified as 'Accessibility Supported' under the WCAG 2.0 definition.
- **Phase three** focused on *user experience* and was designed to understand the experience of people with a disability when using PDF files, including representative files available on government websites and a sample of PDF files optimised for accessibility.

### **About WCAG 2.0**

The release of WCAG 2.0 by the W3C on 11 December 2008 introduced the concept of 'Accessibility Supported' technology. WCAG 2.0 identifies techniques to create and manage web content (i.e. dynamic and static textual, visual, or audio electronic information) in ways that are more accessible to people with a disability. It promotes an approach of technology independence where the Guidelines can theoretically be applied to any technology, such as PDF, to determine its level of accessibility. A technology that has the capability to meet the guidelines and work with assistive technologies and the accessibility features of operating systems, browsers and other user agents is described as 'Accessibility Supported'.

WCAG 2.0 stipulates that rather than just meeting specific technical criteria (e.g. noting how tables should be marked up in HTML), content should be Perceivable, Operable, Understandable and Robust. Under these four Principles, twelve Guidelines are organised which further clarify the purpose of each Principle. Each Guideline has a number of Success Criteria which provide a means to check conformance to that Guideline. Different web technologies (e.g. PDF, HTML, Java Script) will be able to demonstrate conformance to Success Criteria by applying 'Sufficient Techniques'. As such, there will be multiple ways in which a website could claim WCAG 2.0 conformance.

WCAG 2.0 has been adopted by governments around the world. As a result, there is a need to determine whether it is possible to create PDF files that conform to the Guidelines.

In 2008, prior to the release of WCAG 2.0 as a Web Standard, the W3C published *Reports on Accessibility Support for Ways of Using Various Web Technologies*<sup>5</sup>. It included a report from Adobe to demonstrate how PDF files might address WCAG 2.0 Success Criteria. The report does not prove WCAG 2.0 conformance, nor suggest that the Portable Document Format is endorsed by the W3C as an 'Accessibility Supported' technology. The report developed by Adobe, *Accessibility Support Documentation for PDF*<sup>6</sup>, formed part of the Study and helped progress WCAG 2.0 to the next stage in the W3C web standard development process.

<sup>5</sup> World Wide Web Consortium, 2008, *Reports on Accessibility Support for Ways of Using Various Web Technologies*, viewed 23 April 2010, [http://www.w3.org/WAI/GL/WCAG20/implementation-report/accessibility\\_support](http://www.w3.org/WAI/GL/WCAG20/implementation-report/accessibility_support).

<sup>6</sup> Adobe Systems Incorporated, 2008, *Accessibility Support Documentation for PDF*, viewed 23 April 2010, [http://www.w3.org/WAI/GL/WCAG20/implementation-report/PDF\\_accessibility\\_support\\_statement](http://www.w3.org/WAI/GL/WCAG20/implementation-report/PDF_accessibility_support_statement).

*Accessibility Support Documentation for PDF* and associated testing from Adobe did not include a complete collection of commonly-used assistive technologies used by people who are blind or have low vision, as identified in the second phase of this Study. As such, Vision Australia invited Adobe to conduct further tests with the most common assistive technologies used in Australia using the Adobe Test Suite methodology.

### **About the Portable Document Format**

The Portable Document Format was created by Adobe Systems (Adobe) in 1993. In July 2008, PDF became an open standard, registered by the ISO as ISO/IEC 32000-1:2008 Document Management – Portable Document Format – Part 1 PDF 1.7. PDF files are widely used to publish and distribute information. For many, the attractiveness of using PDF is primarily in its ability to create a print-equivalent document that is readily available on most platforms. The software to view the files is also freely available on most platforms, hence its dominant market position.

It is possible to create PDF documents of different qualities. The application used to generate the PDF document and the process followed in creating it directly affects the accessibility of the resulting document. A PDF file can have a low, or no, level of accessibility (i.e. a scanned image) or a very high level (i.e. a fully-tagged PDF).

Accessibility considerations were first introduced for PDF files around 2001. Adobe worked with assistive technology vendors to improve compatibility between the assistive technologies and its Adobe Reader software. Assistive technologies rely on proper structural mark-up to provide the user with contextual information about a document. The ability of the PDF file to support this structural information, and of an assistive technology to interact with it, is the benchmark in determining if a PDF file is accessible.

Since Adobe Reader version 4.05, Adobe has introduced improved accessibility support and a number of accessibility features into Adobe Reader. These include: a text-to-speech document reader; presentation settings to allow the user to customise the appearance of the document to suit their preferences; and a utility to support assistive technology users by inferring the document structure for a PDF file where this has not been provided by the document author.

In their *Accessibility Guide: PDF Accessibility Overview (2008)*<sup>7</sup>, Adobe offers a comprehensive list of characteristics, which in their view, must be present in a PDF file for it to be optimised for accessibility. These include:

- Searchable text;
- Fonts that allow characters to be extracted to text;
- Interactive form fields;
- Other interactive features: buttons, hyperlinks, and navigational aids;
- Document language (specified);
- Security that will not interfere with assistive technology;
- Document structure tags and proper reading order; and
- Alternative text descriptions.

<sup>7</sup> Adobe Systems Incorporated, 2008, *Adobe® Acrobat® 9 Pro Accessibility Guide: PDF Accessibility Overview*, viewed October 2009, <http://www.adobe.com/accessibility/products/acrobat/pdf/A9-pdf-accessibility-overview.pdf>.

The PDF Universal Access Committee (PDF/UA) is developing an ISO specification for accessible PDF files. The standard will establish, independently of Adobe, a set of guidelines for creating accessible PDF files so conforming files will be more accessible and usable to all, including people with a disability. The PDF/UA documentation is currently in the committee draft stage. A full ISO standard is expected in 2011.

While a number of projects and organisations are involved in exploring the question of PDF accessibility around the world, there is no agreed definition on what constitutes an accessible PDF that can be applied at this time, other than those offered by Adobe or WCAG 2.0.

### ***The legislative context in Australia***

Access to information is one of the many aspects covered by the DDA. To help people in the community understand how the DDA applies to web content, the AHRC provide Advisory Notes. Through the Advisory Notes, the AHRC communicates a strong position about the difficulties that exist for people with a disability using PDF files. The Commission notes *“that organisations who distribute content only in PDF format, and who do not also make this content available in another format such as RTF, HTML, or plain text, are liable for complaints under the DDA”*. The Australian Government’s policy position has supported the AHRC.

The importance of ensuring that information is accessible to everyone in the community has been strengthened through Australia’s ratification of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) on 17 July 2008<sup>8</sup>. The Convention includes articles that specifically relate to accessibility of information:

*“(Article 9) ... requires countries to identify and eliminate obstacles and barriers and ensure that persons with disabilities can access their environment, transportation, public facilities and services, and information and communications technologies.*

*(Article 21) ... to promote access to information by providing information intended for the general public in accessible formats and technologies, by facilitating the use of braille, sign language (Auslan) and other forms of communication and by encouraging the media and Internet providers to make on-line information available in accessible formats.”*

The endorsement of WCAG 2.0 for all Australian Government websites provides further evidence of the Australian Government’s commitment to more open and accessible information and services, especially for people with a disability.

<sup>8</sup> United Nations, 2006, *Convention on the Rights of Persons with Disabilities*, viewed 30 April 2010, <http://www.un.org/disabilities/default.asp?navid=13&pid=150>.

As part of the endorsement of WCAG 2.0 and its proposed implementation across all government websites, clear guidance is required to assist web developers in understanding the implications that various web technologies have for people with a disability. Because of its widespread use, establishing the accessibility of PDF files and the impact of their use for people with a disability is tightly linked to the adoption of WCAG 2.0 in Australia, as is the ratification of the UNCRPD.

### ***Computer use by people with a disability***

In 2003, the ABS Survey of Disability, Ageing and Carers identified that one in five people in Australia (3,958,300 or 20.0%<sup>9</sup>) reported having a disability. This data only captures people who report that they have a disability. Many people do not consider their impairment to be a disability and do not report that they are disabled, so the figure may be higher. Additionally, it is widely understood that the number of people with a disability is increasing due to the ageing population. Information and services are becoming increasingly available online and the use of computers and the internet is growing at a rapid rate in the community – between 1998 and 2008-09, household access to the internet in Australia more than quadrupled from 16% to 72%. However, computer interaction can be severely hindered for people with a disability.

During the online consultation, a submission provided by Mireia Ribera Turró, Professor at Universitat de Barcelona Department of Library and Information Science detailed the types of disabilities that have direct effects on digital reading and associated activities. People with a disability often rely on various ‘adaptive strategies’ to improve interaction with computers. Some of these adjustments are relatively straightforward and available as part of their computer while others involve the use of an assistive technology – specialised hardware or software that extends the functionality of the computer to support the individual’s interaction method. It is important that web content creators have an understanding of these issues and so they have been included here.

There are three main groups of print disabilities that also affect the comprehension of graphics:

- **All degrees of vision limitations**, from total blindness to reduced vision, colour-blindness, and other dysfunctions. The most widely used assistive technology for total blindness is that of screen readers, which interrogate the information on the screen and transform it into spoken text or braille. Reduced vision makes it difficult to read or capture the information offered; for persons with this disability, screen magnifiers offer an optical zoom of the information shown in addition to colour and contrast adjustment. In both cases, additional information in the document is often required, such as explanatory subtitles for video recordings and alternative descriptions for images.

<sup>9</sup> Australian Bureau of Statistics, 2003, *Disability, Ageing and Carers: Summary of Findings*, viewed October 2009, <http://www.abs.gov.au/AUSSTATS/abs@.nsf/Lookup/4430.0Main+Features12003>.

- **Motor skill limitations**, particularly those affecting the upper extremities. This disability hinders the interaction with information and the activation of controls, links, and even linear scrolling in the document. There is a great variety of assistive technologies for persons with this disability, including pointing devices, alternative keyboards, voice synthesis technologies for activating controls, and even assistive technologies for automatic text completion.
- Different types of **cognitive** disabilities that affect reading comprehension. Those caused by dyslexia or early deafness can benefit from screen magnifiers, screen readers, and automatic text completion. Those caused by cognitive disabilities—which have not been widely studied—often require a simplified presentation of the information through graphics or Plain English<sup>10</sup>.

It is also important to understand how some of these assistive technologies work in principle.

- **Screen reading** software reads out the information contained in a document. Unlike text-to-speech software, a screen reader relies on tags and elements within the file to also communicate visual details such as the structure and appearance of the document, and to provide navigation aids such as reading order and the ability to move through the document by lines, headings, and paragraphs.
- **Screen magnification** software magnifies how the information is presented on the screen. This software can also be used to control colours and contrast and often includes a text-to-speech capability.
- **Braille displays** are an output device used in conjunction with a screen reader and present the spoken information in braille.
- **Braille Notetakers** are used by people who are blind. These portable devices provide speech and braille output of information and include functionality such as a notepad, calendar and contacts. They provide an equivalent option to a sighted person using notepad, diary, address book and printed documents.

Determining how each of these adaptive strategies applies to PDF files is essential in understanding the experiences of people with a disability and the discrimination implications that may exist. Because of the nature of their adaptive strategies, people who are blind or have low vision are considered to experience the most significant problems when accessing PDF files. This group rely on assistive technologies such as screen readers that interact with the elements and structure of the PDF file. Hence the technical ability of their chosen assistive technology in recognising those structures, coupled with the way the information is actually presented in the PDF file itself, is fundamental to their success.

For this reason, phase one and phase two of the Study focused on the experiences of people who are blind or have low vision. Phase three (user evaluations) included representation from all disability groups.

<sup>10</sup> Turro, M. R., 2008, *Are PDF documents accessible?*, Vol.27, no. 3, pp.25-43, Information Technology and Libraries, viewed October 2009.

It is worth noting that the 2004 *Clear Insight* report<sup>11</sup> identified that 480,000 Australians who reported having a disability were recorded as being vision impaired in both eyes, and over 50,000 of these people were blind. The report's projections indicated that, due to an ageing population, blindness is set to increase by 73% over the next two decades.

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<sup>11</sup> Eye Research Australia, 2004, *Clear Insight: The Economic Impact and Cost of Vision Loss in Australia*, report prepared by Access Economics Pty Limited.

three Phase one: user consultation –  
the user perspective



three

## three Phase one: user consultation – the user perspective

A series of user consultations were conducted to establish the specific issues and experiences of people with a disability using PDF files. Feedback was sought via focus groups (three sessions) managed by Vision Australia and a public online consultation managed by AGIMO.

### Focus Groups

The focus groups aimed to elicit feedback from the blind and low vision community, as they are considered to experience the most significant issues with PDF files. Focus groups were made up of users with low vision or blindness, who self-classified their level of IT and internet experience as low, medium or high. The focus groups sought to determine:

- the reason people who are blind or have low vision come into contact with PDF files;
- their experience in using PDF files with their adaptive strategy (i.e. assistive technologies or customised settings);
- the impact of these experiences; and
- the circumstances under which a PDF file would be considered acceptable to them.

### Encountering PDF files

Participants encountered PDF documents from a wide variety of sources including government, banks, telecommunication companies, restaurants, education providers and real estate agents. The need to interact with PDF files commonly occurred in activities related to their work and personal affairs where the use of the format is often deemed unnecessary by the participants. In many situations, participants had difficulty understanding why a different document type was not used (i.e. supplying menus and newsletters only as PDF files). Participants expressed the view that organisations appear to be providing information in PDF files with no awareness or acknowledgement of the accessibility issues it may cause for others.

Overall, participants had negative experiences when encountering PDF files in all of these situations.

### Problems using PDF files

People who are blind or have low vision experience a number of problems when accessing and interacting with PDF files. The visual design and layout of documents presents screen reader users with obstacles. People in all three focus groups commented on the issues around multi-column design. In these situations, a screen reader will, rather than read each column in the correct order, generally read along the top line of both columns, then to each subsequent line of both columns, thus fragmenting the information and making the content incomprehensible.

The more experienced participants expressed the view that content authors who fail to provide structural mark up and appropriate tags for textual content, tables, forms, images and graphs are partially the cause of this problem. Less experienced users did not understand the cause of these problems.

Participants who were blind reported that a document scanned and saved as a PDF file cannot interact with their screen reader, as it is an image and thereby inaccessible to them. Scanned documents also pose issues for people using screen magnification software as the ability to view and read a scanned file is dependent on the quality of the scanned image. The quality of a scanned PDF file automatically deteriorates when magnified so that poor-quality scanned files are also unreadable for many low vision users.

Participants also noted that there is no way of knowing if a file had been created in an accessible way before downloading and opening it.

### **Workaround solutions**

When using scanned PDF documents, participants reported having to use alternative methods to gain access to the content within the file. However, this was contingent upon having access to Optical Character Recognition (OCR) software and possessing the skill to use it. Other workarounds included asking for assistance from a sighted colleague/friend or asking the organisation to provide the information in an alternative format.

Participants reported that alternative methods often enable them to access the content, but require a level of expertise with additional software, more time and extra effort. The use of workarounds to access inaccessible PDF files results in a degraded experience when compared to accessing equivalent documents in HTML, RTF or Microsoft Word formats.

### **Assistive technologies and PDF files**

Participants noted older screen readers and Adobe Reader did not work effectively. However, their experiences with recent versions of these technologies indicate a noticeable improvement.

Some participants expressed that, in their experience, the support for PDF files by portable devices, such as portable Braille Notetakers and the VictorReader Stream (DAISY player), is non-existent. Participants who used these technologies found this particularly frustrating as they are unable to read and interact with PDF documents through these devices.

### **Interaction with Adobe Reader**

Participants acknowledged that Adobe Reader has improved its support for accessibility in later versions of the software. However, there are often issues with correct display of page numbers. For example, page numbers within a PDF document do not always correspond with the numbering assigned to the document by the Adobe Reader Page Navigation toolbar. Therefore, users are often not sure what page in a document they are actually on, leading to confusion and frustration, especially with long documents.

Participants reported that the Adobe Reader interface is an unfamiliar environment and they discussed their lack of knowledge on how to use it with their assistive technology. Adobe provides regular updates for the Adobe Reader, however the participants were not always aware of the benefits of these updates (i.e. why they should update) or how to update.

### ***Public online consultation***

AGIMO conducted a public consultation on the accessibility of PDF files to seek wider feedback from members of the public with a disability, disability organisations, industry, academia and government. Broad findings of the public consultation are considered as part of the Study. The consultation attracted 38 submissions from individuals, disability organisations, vendors of accessibility products and services and government organisations. Submission details are included in the Appendix.

Submissions covered a wide range of topics and many varied – often emotive – opinions. Of the 38 submissions, 80% of respondents did not support the use of PDF files, believing they create many accessibility problems for people with a disability. This was primarily evident in the submissions received by the organisations who represent people with a disability (100%) and by the majority of people who made personal submissions (60%). Most personal submissions were made by people with a disability and were based on their lived experience.

Interestingly, only 20% of the submissions provided support for the use of PDF files, claiming that they are accessible. However, all of the submissions made by people who work in the field of web accessibility provided conditional support for the use of PDF files if used appropriately, created accessibly and tested properly.

The submissions received from government agencies also varied, but did not provide categorical support for the use of PDF files. In fact, the majority of the government submissions noted that the use of PDF files was prolific and not always appropriate, but noted the Portable Document Format was preferred over other formats. Each submission also raised the need for updated and specific guidance on the use of PDF files and how to create them more accessibly.

Overall, the online consultation provided insight into the level of misinformation about the accessibility of the Portable Document Format. It also highlighted that much of the misinformation that exists is largely based on: personal preference, anecdotes, outdated information, and incorrect interpretations of published materials. The submissions also indicate there is a lack of knowledge about when to use the Portable Document Format, how to author or create more accessible PDF documents, how to validate the accessibility of a PDF file and of the impact that poorly-created PDF files have on people with a disability.

Notwithstanding the very important contributions from people who have a disability, it is difficult to balance the technical claims of PDF accessibility against the actual experience of the persons interacting with the file. This confirms the critical role that user testing must play in the development of accessible web content.

four Phase two: technical evaluation –  
the technical perspective



four

## four Phase two: technical evaluation – the technical perspective

Focus group participants and contributors to the public consultation, particularly those who are blind or have low vision, noted improvements in recent versions of their assistive technology for the Portable Document Format. To confirm these assertions, research was conducted to:

1. Identify the most common assistive technologies used by people who are blind or have low vision in Australia;
2. Ascertain the level of technical capability provided by the most common assistive technologies when interacting with the Portable Document Format, as claimed by vendors; and
3. Test the technical conformance of PDF against WCAG 2.0 Success Criteria in commonly used assistive technologies to determine the level of technical capability for the Portable Document Format.

### Common assistive technologies used in Australia

A series of telephone and email interviews with disability organisations assisted in establishing the most common assistive technologies used by people in Australia who are blind or have low vision. The results are represented in Table 1: Common assistive technologies in Australia. The table indicates the assistive technology version people are using together with the estimated total number of users, the current purchase cost (without software maintenance agreements) and upgrade costs where a user is upgrading from a previous version. The screen reader SATOGO is free for users but does require a constant internet connection when used. VoiceOver is also free as it comes preinstalled on Apple Macintosh computers.

Table 1: Common assistive technologies in Australia

Assistive Technology	Device	Most common versions	Total number of users	Purchase cost	Upgrade cost
Braille Notetaker	BrailleNote	NA	200	\$8890.00	\$350.00
	PAC Mate	NA	Less than 200	\$8779.00	\$350.00
Screen Reader	JAWS	8-11	3,000	\$1502.00	\$334.00
	Window-Eyes	7	300	\$1100.00	\$315.00
	SATOGO	NA	100	Free	NA
	VoiceOver	NA	100	Free	NA
	NVDA	NA	50	Free	NA
Screen Magnifier	ZoomText	8 & 9	4,000	\$591.00	\$160.00
	MAGic	9.5 - 11	750	\$469.00	\$262.00

The research found JAWS is the most commonly used screen reader, with an estimated 3,000 users, and ZoomText is the most commonly used screen magnifier with an estimated 4,000 users.

The number of users for each assistive technology is based on data provided by assistive technology vendors or service provider organisations. Of particular note, there is no data about the number of people who might be using older versions of assistive technologies. Feedback from Vision Australia clients indicates that some people continue to use earlier versions due to the prohibitive cost of upgrading their assistive technology. With each new release, assistive technologies generally provide more support for different applications and formats, particularly new formats or features that did not exist for previous versions. If people are unable to upgrade to the latest versions of their assistive technology, then successful interaction with technologies such as PDF files will be impeded.

The reported number of assistive technology users in Australia is relatively low compared to the number of people who are blind or have low vision (480,000). The figure fails to reflect the number of people in Australia who would benefit from using an assistive technology, but currently do not have access due to a lack of awareness, support or finance. It should be noted that the existence of relatively low numbers of assistive technology users does not provide any justification for inaction when providing accessible information.

The usage of portable Braille Notetakers (BrailleNote and PAC Mate) is relatively low. The high cost of these devices places them out of the financial reach of many users. These devices are more widely adopted by people in employment with access to equipment funding schemes.

In addition to the Australian findings, a correlation of the January 2009 *WebAIM Screen Reader Survey*<sup>12</sup> indicates that JAWS was also the most widely-used screen reader internationally. A significant proportion of the survey base, 74% of 1121 respondents, indicated they use JAWS.

The emergence of several free or low-cost screen reader options (NVDA, VoiceOver and SATOGO) is starting to penetrate the Australian market. These technologies currently have low uptake (in Australia), but their numbers are growing and this is expected to continue.

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<sup>12</sup> WebAIM, 2009, *Survey of Preferences of Screen Readers Users*, Utah State University, viewed 10 March 2010, <http://www.webaim.org/projects/screenreadersurvey/>.

**Vendor support for assistive technologies**

To ascertain the level of technical capability between common assistive technologies and PDF files, assistive technology vendors (or their Australian resellers) were asked to provide advice on support for PDFs through their assistive technology device, including known issues and plans for future development.

The responses from the vendors and resellers were substantiated by a review of the documentation (i.e. vendor release notes) that accompanied the assistive technologies, where available.

Table 2: Responses from assistive technology vendors and resellers provides a summary of vendor statements. Noting that Freedom Scientific directed all correspondence regarding their products (i.e. PAC Mate, JAWS, Magic) in relation to this Study to the Australian reseller – Quantum Technology.

Table 2: Responses from assistive technology vendors and resellers

Adaptive Strategies	AT Device	Vendor/ Reseller	Support introduced	Current level of support	Known issues	Future developments
Braille Notetaker	BrailleNote	HumanWare	No support provided	None	NA	No plans to introduce support for PDF
	PAC Mate	Quantum Technology	v 6.2	Requires separate PDF reader, but " <i>should experience good results</i> "	Document is read one page at a time	Resolve continuous reading issue. Future development will be upgraded in line with improvements in JAWS support
Screen Reader	JAWS	Quantum Technology	v 8	Equivalent to HTML	PDF security restricts access to some documents	None
	NVDA	NV-Access	v 2009.1	In line with HTML	Around access to encrypted documents	Ongoing, but nothing specific
	SATOGO	Serotek	v 3.0	In line with HTML and Word	Cannot navigate by headings	No plans to address heading issue or provide further support
	VoiceOver	Apple Macintosh	OS 10.5	Preview is a general file reader and does not provide specific support for PDF	Structured tags not recognised	None
	Window-Eyes	GW Micro	v 4.5	Provides most of the functionality available for HTML	Cannot read or navigate via headings	Resolve heading issue
Screen Magnifier	MAGic	Quantum Technology	v 9.5	Equivalent to HTML	None	None
	ZoomText	Ai Squared	v 8	Functionality same as for HTML and Word	Problems loading some types of PDF files with ZoomText running	Working with Adobe to rectify loading issues

Based on statements provided by the vendors, the following assistive technologies provide the theoretical technical capability to support PDF files:

- JAWS (versions 8 to 11)
- MAGic (versions 9.5 to 11)
- NVDA (version 2009.1)
- PAC Mate (Omni series running version 6.2 software)
- SATOGO (version 3.0)
- WindowEyes (version 7)
- ZoomText (versions 8 to 9)

Overall, vendors indicate that support has generally been introduced in more recent versions. Therefore, versions that predate these are unlikely to provide sufficient technical capability for PDF files. Only JAWS, NVDA, SATOGO and MAGic claimed to provide an experience equivalent to HTML. The vendors of Window-Eyes and ZoomText claim to provide functionality largely in line with other formats, but did not state whether the level of support was equivalent to these other formats.

The interviewees reported that assistive technology development is guided by emerging technologies and industry trends, and the core focus for research and development is now moving towards Web 2.0, ARIA and HTML 5 (responses provided by vendors of SATOGO and Window-Eyes). Most vendors of assistive technologies common in Australia (BrailleNote, PAC Mate, JAWS, Window-Eyes and MAGic) felt that the responsibility for PDF accessibility now lies with document authors. Vendors felt their current level of support is sufficient and authors need to create more accessible PDF files before the vendors see further benefit in providing increased PDF support to end-users.

Adobe Reader is the most commonly-used PDF reader, and developments on the application programming interface (API) have enabled better support for assistive technologies. As such, all but one of the vendors stated their support for PDF was geared towards the latest version of Adobe Reader. The one exception was Apple Macintosh (VoiceOver) – Apple directs its PDF support into its own PDF reader (Preview). Vendors proposed the view that in order to offer equal support and functionality for other PDF readers, the developers of other PDF readers would need to provide the same level of support (as Adobe Reader) to the assistive technology first.

### ***Technical testing***

The aim of the technical evaluations (phase two of the Study) was to establish the level of technical capability of the Portable Document Format to conform to WCAG 2.0, and its interoperability with the common assistive technologies identified earlier. A secondary aim of the Study was to assess claims for 'Accessibility Support' in relation to the PDF technology.

## Adobe Test Suite

In 2008, prior to WCAG 2.0 being released as a Web Standard, the W3C published *Reports on Accessibility Support for Ways of Using Various Web Technologies*. It included a report from Adobe to demonstrate how PDF files might address WCAG 2.0 Success Criteria. The report does not prove WCAG 2.0 conformance, nor suggest that the Portable Document Format is endorsed by the W3C as an 'Accessibility Supported' technology. The report developed by Adobe, *Accessibility Support Documentation for PDF*, formed part of this Study and helped progress WCAG 2.0 to the next stage in the W3C web standard development process.

The *Accessibility Support Documentation for PDF* report and associated testing from Adobe did not include a complete collection of commonly used assistive technologies used by people who are blind or have low vision, as identified in phase two of this Study.

The Adobe Test Suite originally evaluated three assistive technologies and user agent (web browser) configurations against limited, self-assessed WCAG 2.0 Success Criteria. For this Study, Vision Australia invited Adobe to extend its testing, applying the same methodology (as applied in the Adobe Test Suite) to include the most common assistive technologies (or versions) that Vision Australia identified as potentially providing sufficient support, based on the vendor claims. Table 3: Assistive technology testing requirement outlines the assistive technologies tested.

## Exclusions

The BrailleNote and PAC Mate devices were not tested in this Study. BrailleNote does not support PDF. The PAC Mate vendor (Quantum Technology) claimed that PAC Mate uses JAWS speech and provides equivalent support apart from a known issue with continuous page reading.

Screen magnification software, such as ZoomText and Magic, does not interact with the structure of PDF files. For this reason, these products were also excluded from the testing. However, since the magnification component in ZoomText version 9 was included in the original Adobe report and ZoomText is the most commonly used assistive technology product in Australia, Adobe was invited to test the magnification component in ZoomText version 8 to confirm the original findings and vendor's claim of support since the earlier version. Further details about the methodology used in the Adobe Test Suite is contained in the Study approach and methodology section.

Table 3: Assistive technology testing requirement

Adaptive Strategies	AT Device	Version	Not required	Previously tested	Testing required	Comments
Braille Notetaker	BrailleNote	N/A	X			Vendor claims no support for PDF
	PAC Mate	6.5	X			Vendor claims PAC Mate uses JAWS speech and JAWS testing results will apply. Not independently tested
Screen Reader	JAWS	8 - 11		X	X	JAWS 9 tested in 2008. Vendor stated no change in functionality since v9 so results applied to JAWS 10 & 11. Vendor claim support including JAWS v.8, testing of earlier version is required
	NVDA	2009.1			X	Not previously tested, AT interacts with structure
	SATOGO	3.0			X	Not previously tested, AT interacts with structure
	VoiceOver	10.5 & 10.6		X	X	OS 10.5 tested in 2009. Vendor claims improvements to VoiceOver in subsequent version. Testing of OSX 10.6 is required
	Window-Eyes	7		X		Tested in 2008
Screen Magnifier	MAGic	9.5 - 11	X			Does not interact with structure testing not required
	ZoomText	8 & 9		X	X	Does not interact with structure. ZoomText 9 magnification tested in 2008. Vendor claims support since ZoomText v.8 testing of earlier version is required

## Phase two – technical evaluation results

To summarise the data, three levels describe the technical capability of the assistive technologies with PDF files. These are:

1. **Sufficient:** Provides technical capability that enables the assistive technology to interact with PDF files.
2. **Partially Sufficient:** There are some technical capabilities using the assistive technology, but also potential issues that may impact upon the interaction with a PDF file.
3. **Not Sufficient:** Provides inadequate technical capability for the assistive technology to interact with PDF files.

Table 4: Assistive technology support for PDF finding

Adaptive Strategies	AT Device	Version	AdobeTest Suite Results	Sufficient	Partially sufficient	Not sufficient	Total number of Users
Braille Notetaker	BrailleNote	NA	NA			X	200
	PAC Mate	6.5	NA		X		Under 200
Screen Reader	JAWS	8 - 11	43/43	X			3,000
	NVDA	2009.1	41/43		X		50
	SATOGO	3.0	36/43		X		100
	VoiceOver	10.5 & 10.6	9/43			X	100
	Window-Eyes	7	36/43		X		300
Screen Magnifier	MAGic	9.5 - 11	NA	X			750
	ZoomText	8 & 9	21/21*	X			4,000

Notes: The total number of users refers to all versions of the assistive technology, not just the most commonly-used versions. Numbers are reflective of comments made by vendors and may not be truly indicative of the market.)

For ZoomText, 22 of the Adobe Test Cases were not applicable to the screen magnification component of the software as it does not interact with the structure of the PDF file.

The specific number of test results for each of the 43 tests applied is included in the Supplementary Report. Only the JAWS screen reader and the ZoomText screen magnifier (magnification component) met all of the applicable tests of the Adobe Test Suite (with support by vendor claims). Therefore the technical testing finds that the Portable Document Format provides 'sufficient' technical capability for JAWS and ZoomText only. When correlated with vendor claims and an examination of the functionality of MAGic, a 'sufficient' technical capability claim can also be applied to MAGic.

However, it is inappropriate to state that PDF files can be regarded as an 'Accessibility Supported' technology under the W3C definition, without qualification.

Only 33% of the most common assistive technologies used in Australia provide 'sufficient' technical capability (demonstrated through the Adobe Test Suite and vendor claim); it is estimated that these assistive technologies are used by 89% of the assistive technology user population. The remaining 66% provide 'partially sufficient' or 'not sufficient' technical capability; and it is estimated that these assistive technologies are used by 11% of the user population.

The Adobe Test Suite should not be considered proof of WCAG 2.0 conformance, although it does go some way in identifying attributes and features that improve accessibility between the technology and interoperability with assistive technologies.

An analysis of the specific test cases highlights a number of limitations, especially important to users of screen readers that were not covered in the Adobe Test Suite. For example, the presentations of text (bold, italicised), which is a component of WCAG 2.0 Success Criteria 1.3.1, is not included in the Adobe Test Suite and was therefore not tested. Adobe is currently increasing the scope of the test suite against WCAG 2.0 Success Criteria.

WCAG 2.0 conformance can be supported using Sufficient Techniques, however there are no available Sufficient Techniques for PDF at the time of writing (August 2010).

Summary qualification of the issues encountered with each assistive technology described below:

### **BrailleNote**

BrailleNote does not provide support for PDF files, therefore BrailleNote was not tested.

### **PAC Mate**

The PAC Mate reseller (Quantum Technology) claimed that PAC Mate uses JAWS speech and provides equivalent support apart from a known issue with continuous page reading. Therefore PAC Mate was not tested. NOTE: Findings from Phase 3 – user evaluations demonstrated significant technical problems using PDF files and therefore the overall technical capability of PAC Mate is deemed to be not sufficient for this Study.

### **JAWS 8-11**

JAWS 8 and 9 satisfied all of the technical tests. The vendor stated that functionality for PDF files had not changed since version 9 and therefore versions 10 and 11 were not tested.

### **NVDA 2009.1**

NVDA passed 41 out of the 43 test cases. NVDA failed to provide support for identifying the language of a document or changes to language within a document. NVDA currently does not provide this support for PDF files.

### **SATOGO 3.0**

SATOGO provides insufficient support for the identification of a document's language, and a lack of identification when the language changes within a document. In relation to structural mark-up, the correct reading of tagged paragraphs is only partially supported by SATOGO, and headings, though identified, cannot be navigated via defined levels. SATOGO also failed to interact with review comments added to a PDF document.

### **VoiceOver 10.5 & 10.6**

Structural mark-up and tags are not identified when using VoiceOver with Preview, leading to significant accessibility issues, including the inability of VoiceOver to read alternative descriptions for images or identify or allow navigation of headings and tables. VoiceOver was also unable to access and interact with form elements (e.g. checkboxes, edit fields) correctly, identify error messages or identify the language of the whole document or sections within it.

### **Window-Eyes 7**

Window-Eyes failed to identify headings in a PDF document or provide support for heading navigation within a document. It failed to read the role or function of a nested list in a document, and identify the language of the whole document or sections within it.

### **ZoomText 8 & 9**

ZoomText (magnification component) does not interact with structure. However, since ZoomText is the most commonly used screen magnifier in Australia, versions 8 and 9 were included in technical testing. ZoomText 8 and 9 (magnification component) satisfied all applicable technical tests.

### **MAGic**

MAGic (magnification component) does not interact with structure. Therefore MAGic did not undergo technical testing. Vendor claims support since version 9.5.

five Phase three: user evaluations –  
the lived experience



five

## five Phase three: user evaluations – the lived experience

The phase two technical evaluations identified seven assistive technologies used by people who are blind or have low vision that provide ‘sufficient’ or ‘partially sufficient’ technical capability for the Portable Document Format. However, the user perspectives offered in phase one identified that users still experienced difficulties in accessing PDF files through technologies deemed to provide ‘sufficient’ or ‘partially sufficient’ capability.

User evaluations play a critical role in identifying technical and practical accessibility issues from the end-users perspective. While conformance to standards is important, it is widely accepted that user evaluations provide the most reliable information as to whether a product or service achieves its purpose.

In terms of web accessibility, the W3C offers that *“web accessibility evaluation often focuses on conformance to accessibility standards such as WCAG. While conformance is important, there are many benefits to evaluating with real people to learn how your website or web tool really works for users and to better understand accessibility issues. Evaluating with users with disabilities and with older users identifies usability issues that are not discovered by conformance evaluation alone”*<sup>13</sup>.

The user experience evaluations carried out in this Study were conducted against the ISO’s approach to assessing usability and accessibility defined earlier. This was interpreted to mean that, for the PDF format to be usable and accessible, the participants should be able to use the PDF files with their chosen adaptive strategy to achieve their goals:

- *effectively* (error free completion of tasks);
- *efficiently* (in an acceptable amount of time); and
- with *satisfaction* (expectations are met).

Twenty-three user experience evaluations were undertaken on eight PDF files by people using different adaptive strategies. Participants were asked to perform six tasks on two sets of PDF documents and were assessed by a Vision Australia evaluator. Participants were interviewed before and after their evaluations to ascertain their level of experience prior to undertaking the tasks and then to determine their overall satisfaction with the result. A full breakdown of the interview questions is included in the Supplementary Report.

In developing the user experience evaluations, findings from the focus groups conducted in phase one were used to highlight three core dimensions for consideration:

1. The type of disability and the user’s adaptive strategies, including the type of assistive technology used to interact with PDF files;
2. The skill and experience of the user; and
3. The way the PDF file is created.

<sup>13</sup> World Wide Web Consortium, 2010, *Involving Users in Evaluating Web Accessibility*, viewed October 2009, <http://www.w3.org/WAI/eval/users>.

## Participants

The accessibility of PDF files potentially affects a whole range of people with a disability. The main disability groups when referring to how people with a disability use the web are:

1. Blind (including Deafblind)
2. Low vision
3. Cognitive
4. Mobility
5. Hearing<sup>14</sup>

Within the disability groups, participants were recruited who use various assistive technologies that were classified as ‘sufficient’ or ‘partially sufficient’ in the Technical Evaluation. Experience or skill level had been highlighted as a factor that impacted on a participant’s ability to use PDF files during the user consultations in Phase one of the Study. As such, users with different skill levels/experience using their assistive technology, particularly for screen reader users, were chosen.

Dragon Naturally Speaking Professional, Read Out Loud, Read & Write Gold, ZoomText speech component, and MAGic speech component were omitted from the technical testing in Phase two because these assistive technologies do not interact with the structure of the PDF file. However, they were included in the User evaluations to explore any usability considerations that may exist when interacting with PDF files.

The Supplementary Report includes participant profiles by disability group and provides a summary of the adaptive strategies they use.

## The PDF test documents

Phase one focus group participants highlighted that the layout and structure of PDF files contributed to their negative experiences. This is largely dependent upon how PDF files are created. To provide a comparative analysis, two sets of document collections were created for the evaluation, Collection A and Collection B.

Collection A comprised a set of PDF documents that had been optimised for accessibility using the Adobe published characteristics of an accessible PDF document<sup>15</sup>. The documents were created with:

- Searchable text
- Fonts that allow characters to be extracted to text
- Interactive form fields
- Other Interactive Features: buttons, hyperlinks, and navigational aids
- Document language (specified)
- Security that will not interfere with assistive technology
- Document structure tags and proper read order
- Alternative text descriptions

<sup>14</sup> World Wide Web Consortium, 2005, *How People With A Disabilities Use the Web*, Working-Group Internal Draft, viewed 20 June 2010, <http://www.w3.org/WAI/EO/Drafts/PWD-Use-Web/>.

<sup>15</sup> Adobe Systems Incorporated, 2008, *Adobe® Acrobat® 9 Pro Accessibility Guide: PDF Accessibility Overview*, viewed October 2009, <http://www.adobe.com/accessibility/products/acrobat/pdf/A9-pdf-accessibility-overview.pdf>.

Collection B included a sample of documents recently published by government departments in Australia.

### Document categorisation

To capture the diversity of documents mentioned in the Phase one focus groups, four types of documents were included for the user evaluations. These included:

- *Long documents*: over twenty pages with heading, lists, simple and complex tables, images, page numbers, headers and footers (to represent annual reports, manuals);
- *Short documents*: around four pages in length with headings, list items and page numbers (to represent newsletters, short reports);
- *Brochures*: contain columns and foreground or background images (to represent brochures); and
- *Forms*: combo boxes and multi-line edit boxes in addition to standard edit boxes, check boxes, radio buttons and error validation (to represent application forms, change of details etc).

Two common PDF document types were excluded from the Study:

- *Scanned documents*: There is sufficient evidence publicly available to identify that interacting with these type of PDF files does not provide a positive user experience for people with a disability.
- *SmartForms*: AGIMO has commissioned a separate piece of work to ascertain the degree to which SmartForms conform to WCAG 2.0.

### Document selection process

To apply objectivity in selection of the PDF documents used in this Study, a four-stage selection process was used. It included:

1. An invitation to Adobe to provide documents in PDF that met the characteristics of an accessible PDF document for Collection A; and an invitation to government departments, via AGIMO, to nominate typical government documents in PDF for Collection B;
2. The documents were assessed for accessibility characteristics by Vision Australia, using the Adobe Pro tool with both a screen reader and screen magnification software. They were categorised into one of the four document types;
3. Many of the documents provided did not meet the specified characteristics required for Collection A so Vision Australia sourced documents from the public domain and asked Adobe to adapt (retrofit) them to meet the characteristics; and
4. Vision Australia completed an independent verification of the documents for Collection A against the accessibility characteristics (defined by Adobe).

Adobe was unable to provide examples of documents for each of the document types that met all the accessibility characteristics, but they did provide examples of the brochure and form document types. The short and long document examples were sourced from the public domain. The accessible characteristics were then retrofitted to these documents by Adobe's accessibility experts, however the process and time taken for retrofitting was not recorded.

Similarly, the files provided by government departments did not meet the accessible characteristics either. In most cases, the departments believed the documents had been created with accessibility in mind. This aligns with the observations from the public consultation which highlighted that misinformation exists about the accessibility of PDF files. It also shows a lack of information about how to create them.

The Supplementary Report provides the summary examples of the documents used in the evaluations.

### User evaluation tasks

Six tasks were created, based on the three core activities people perform when interacting with documents and forms: read, navigate and interact. The specific tasks chosen for the user experience evaluations were guided by the following factors:

- Portable Document Format accessibility characteristics (defined by Adobe);
- PDF design issues raised in phase one - user consultations (page numbering, multi-column design, table navigation etc);
- Technical capability issues identified in phase two - technical evaluation (identification of headings, reading of paragraphs, etc);
- Criteria from the Round Table on Information Access for People with Print Disabilities Inc Guidelines for Accessible E-text<sup>16</sup> (2.1 Arrange text in a linear order, 2.2 Include structural mark-up, 2.3 Verbalise images and visual elements);
- Core skills included in computer training courses provided by Vision Australia for people who are blind or have low vision: general readability (reading character by character, line by line, word by word, sentence by sentence, paragraph by paragraph and say all – a screen reader function), heading navigation, navigating tables and form interaction.

The six tasks were:

#### Read

1. Read a short document (general navigation and interacting with the text);
2. Navigate information in a table structure;
3. Access and understand information portrayed through an image/alt text;

<sup>16</sup> Round Table on Information Access for People with Print Disabilities Inc, 2009, *Guidelines for Accessible E-text*, section 2: Accessible, report prepared by E-text Working Group, <http://www.e-bility.com/roundtable/guidelines.php>.

Navigate

4. Identify and move through a document using document structure;
5. Navigate through a large document using page numbers;

Interact

6. Interact and complete a form.

Activities such as opening a PDF file, saving a PDF file and editing a PDF file were excluded from the set of tasks.

### **User evaluation result (measure of effectiveness)**

Overall the participants succeeded in 77% (188/245) of the tasks they attempted across both document collections. Table 5: Task success rates for each user group highlights the overall findings for each of the core disability groups. In each case the percentage of tasks completed successfully is shown, together with the number of successful tasks out of the total number of tasks attempted. In many cases, not all of the tasks for Collection B were completed by the participants due to time constraints.

The PDF files that were optimised for accessibility (Collection A) provided an enhanced user experience. Overall, participants achieved a 90 % success rate for tasks completed on these documents, compared with a 60% success rate for tasks completed on general PDF files (Collection B).

The user experience testing confirmed that people who are blind and use screen readers experience the greatest difficulties when accessing and interacting with PDF files. Participants who are blind were the only disability group to fail tasks on the documents that were optimised for accessibility.

Table 5: Task success rates for each user group

Task	Collection	Blind	Low Vision	Mobility	Cognitive	Hearing	Overall
Read a short document (general navigation)	A	100% (11/11)	100% (5/5)	100% (3/3)	100% (3/3)	100% (1/1)	100% (23/23)
	B	0% (0/9)	75% (3/4)	100% (2/2)	67% (2/3)	100% (1/1)	42% (8/19)
Navigate information in a table structure	A	64% (7/11)	100% (5/5)	100% (3/3)	100% (3/3)	100% (1/1)	83% (19/23)
	B	0% (0/7)	100% (4/4)	100% (2/2)	100% (2/2)	100% (1/1)	56% (9/16)
Access and understand information portrayed through an image/alt	A	100% (11/11)	100% (5/5)	100% (3/3)	100% (3/3)	100% (1/1)	100% (23/23)
	B	0% (0/9)	100% (3/3)	100% (2/2)	100% (3/3)	100% (1/1)	50% (9/18)
Identify and move through a document using structure such as headings	A	100% (11/11)	100% (5/5)	100% (2/2)	100% (3/3)	100% (1/1)	100% (22/22)
	B	90% (9/10)	100% (2/2)	100% (2/2)	100% (2/2)	100% (1/1)	94% (16/17)
Navigate through a large document using page numbers	A	9% (1/11)	100% (5/5)	100% (3/3)	100% (3/3)	100% (1/1)	57% (13/23)
	B	63% (5/8)	100% (4/4)	100% (3/3)	67% (2/3)	100% (1/1)	79% (15/19)
Interact and complete a form	A	100% (11/11)	100% (5/5)	100% (3/3)	100% (3/3)	100% (1/1)	100% (23/23)
	B	0% (0/10)	100% (4/4)	100% (2/2)	50% (1/2)	100% (1/1)	42% (8/19)
TOTAL	A	79% (52/66)	100% (30/30)	100% (17/17)	100% (18/18)	100% (6/6)	
	B	26% (14/53)	95% (20/21)	100% (13/13)	80% (12/15)	100% (6/6)	

### **Acceptance of time (measure of efficiency)**

Actual time taken for users to complete a task was not used as measure because of the significant variation in task completion time resulting from the different adaptive strategies for each user group. For example, people who are blind and use a screen reader typically take longer than a person that does not solely rely on audio feedback.

A more appropriate measure of efficiency is to ask the users to rate whether the time taken to complete a task was acceptable or not. Though this measure is subjective, it enables the user to judge the acceptability of the time taken against similar experiences based on their interaction method.

Overall, users gave a 91% acceptance rating to the time taken to complete the tasks on the accessibility-optimised documents in Collection A. For those documents representative of government PDFs, Collection B, users rated their acceptance as 84% for tasks completed.

### **Satisfaction ratings (measure of satisfaction)**

For each of the document collections, the participants were asked to also rate their overall satisfaction with the PDF format. Minimal statistical differences were evident between the blind (screen reader) group and the other participants.

Participants were generally satisfied with their use of the Collection A documents and indicated they would be very comfortable in using PDF documents like these again.

After using documents in Collection B, most participants noted they would not be as comfortable using those documents again. However, people who are blind and use screen readers expressed that they were not at all comfortable with these documents, which correlates with their very low level of success achieved with the test tasks.

### **Problems experienced by users**

Where participants encountered an issue during the user evaluation sessions this was recorded. Full details of all the test issues are available in the Supplementary Report

For context, the issues encountered by the participants during the user experience testing have been categorised into four groups. Importantly, none of these factors directly relate to the Portable Document Format. These are summarised in Table 6: Factors affecting PDF files and their impact.

Table 6: Factors affecting PDF files and their impact

Factor	Number of Issues	Impact
Document Design	76 (51%)	The design of the document (e.g. missing tags or elements, problems with reading order, or the way the information was presented) created a barrier for the user.  This required the use of an alternative approach or prevented them from interacting with the document.
AT Support	41 (28%)	The user's AT did not provide sufficient functionality to enable the user to interact with the PDF file using their chosen approach.  In some cases this confirmed findings in the technical testing, in others it highlighted new areas of technical incompatibility.
User Skill	24 (16%)	A lack of knowledge by the user about using their AT, Adobe Reader, or PDF files led to confusion and difficulty in completing the task.
Adobe Reader	8 (5%)	Features provided by the Adobe Reader did not support the user to interact with the document using their adaptive strategy.

Notes: The number of issues comprises 'unique' issues encountered by each assistive technology on each task. It does not take into account the frequency with which an issue occurred for a specific task, or how many users of a specific assistive technology were affected by the issue on a specific task, as the number of users for each assistive technology varied.)

Full details of all the test issues are available in the Supplementary Report.

### Document design

Document design presented the most frequent cause for the issues encountered in the user evaluations. While the issues primarily related to the PDF files in Collection B, a small number of document design issues were also uncovered with the documents optimised for accessibility in Collection A.

The prevalence of document design issues, and the impact these had on users successfully completing tasks, highlights the importance of correct approaches in the creation of accessible PDF files. This confirms the observations made by participants during the User Consultation session. It is concerning that users still experiences significant barriers even though many of the documents from both collections were created with some measure of accessibility in mind.

### Page number task

The task relating to navigating through a large document using page numbers in Collection A had a very low success rate for the eleven screen reader users (9%). As this task was so problematic and the experience consistent for all screen reading software, it is discussed here. Table 7: Success rates for navigating by page highlights the severity of the issue.

**Table 7: Success rates for navigating by page number**

	JAWS	NVDA	SATOGO	Window-Eyes
Success	1	0	0	0
Fail	6	1	1	2

Only one of the eleven screen reader users successfully completed this task – the Deafblind participant who used his remaining sight alongside JAWS.

The high failure rate was due to the document design. The underlying cause of the problem was that the document uses a spread layout, two pages side by side on each A4 page that is meant to facilitate printing but when viewed online presents problems.

The task required the user to move to page 16 of the document. However, because of the two page spread layout Adobe Reader only recognised that the document had 14 screen pages. In essence, the two print pages are included on a single screen page.

Page numbers were specifically identified by participants in the phase one - user consultations as a significant problem for using PDF files with screen readers. The spread layout (used in Collection A tasks) adds extra complexity as screen reader users are unable to ascertain the correct page number using the Adobe Reader Page Navigation toolbar. When documents only present one print page per screen page this issue is largely alleviated (see Collection B results for the same task). This result confirms that finding.

### Assistive technologies

Several assistive technology support issues were exposed during user evaluations. While some of these supported findings from the Phase two - technical evaluations, new issues were found with some of the screen readers:

- Lack of support for table navigation commands in NVDA;
- Instability when opening large PDF files in SATOGO; and
- Inability to navigate by paragraph using JAWS.

The first two issues relate to technical problems that were not identified by vendors nor addressed in the technical testing.

The final issue, with paragraph navigation using JAWS, is not a specific WCAG 2.0 requirement and therefore does not lead to a failure based on the technical evaluation criteria. Instead, this is a user experience issue. In other formats, users are able to navigate by paragraphs; using JAWS, however, this feature is not available when using PDF files. While the participant was able to complete the required task using another method, they reported that the overall experience was not satisfactory because it did not compare to their experience using other common document formats.

Since the PAC Mate vendor claimed some support for PDF files, the intention was to include PAC Mate in phase three – user experience. However, PAC Mate (using the recommended Ornet PDF viewer) was unable to open any of the test PDF files, so the evaluation could not be conducted. Based on this experience, the overall level of technical capability provided by PAC Mate is deemed to be not sufficient in this Study.

### **Overall combined accessibility testing results**

In combining the results of each of the phases of this Study, a comprehensive picture of the status of PDF accessibility is evident. Table 8: Combined summary results provides a comparison.

As noted earlier, the Adobe Test Suite has limitations satisfying all the relevant Success Criteria of WCAG 2.0. This finding, combined with the lack of Sufficient Techniques for WCAG 2.0 available for PDF files (as at August 2010) leads to the conclusion that there is insufficient evidence to prove that PDFs can conform to WCAG 2.0. As WCAG 2.0 is the internationally accepted benchmark for testing the accessibility of web content, and is the endorsed web standard for Australian Government websites, the Australian Government is unable to classify PDF as an ‘Accessibility Supported’ technology at this time.

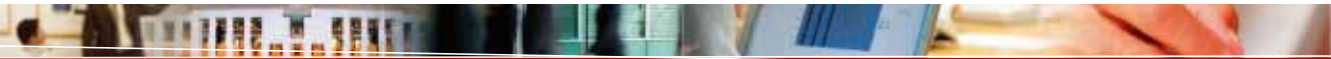
While using JAWS and ZoomText to access PDF files satisfied all of the test cases provided in the Adobe Test Suite, the lack of Sufficient Techniques (at present) to support conformance to WCAG 2.0, means that this is not sufficient evidence of ‘Accessibility Support’. Further, the use of JAWS was unable to satisfy all of the user evaluation tasks in either document collection (A and B). While the test results do indicate that JAWS is more accessible than other assistive technologies (SATO GO or NVDA, for example), the assertion that the use of PDF files with JAWS is accessible is incorrect.

The Study did demonstrate that some assistive technologies and some people with a disability can use and benefit from PDF documents optimised for accessibility. Agencies are encouraged to ensure that, where PDF files are used, these meet the Adobe accessibility characteristics – in addition to providing alternatives.

Table 8: Combined summary results

Adaptive Strategies	AT Device	Version	Adobe Test Suite	User evaluation tasks A / B collections	
Braille Notetaker	BrailleNote	NA	Not tested	Not evaluated	
	PAC Mate	6.5	Not tested	Technical failure – Could not test	
Screen Reader	JAWS	8 - 11	43/4	A 35/42	B 8/29
	NVDA	2009.1	41/43	A 4/6	B 2/6
	SATOGO	3.0	37/43	A 4/6	B 1/6
	VoiceOver	10.5 & 10.6	9/43	Not evaluated	
	Window-Eyes	7	36/43	A 9/12	B 3/12
Screen Magnifier	MAGic	9.5 - 11	Not tested	A 6/6	B 3/4
	ZoomText	8 & 9	21/21	A 24/24	B 17/17
Other ATs tested in User evaluation phase	Adobe Read Out Loud		Not tested	A 6/6	B 2/5
	Read & Write Gold			A 6/6	B 4/4
	Dragon Profess.			A 6/6	B 4/4
	Keyboard only			A 11/11	B 9/9

## six Study approach and methodology



six

## six Study approach and methodology

The Study used a qualitative research framework with multiple methods of data collection including desk research, focus groups, technical analysis and participatory approaches. As the term ‘accessibility’ is highly subjective, the Study relies upon phenomenological research; that is, the primacy of the lived experience, to support a user perspective of accessibility.

The research elements used in the Study involved:

- Three focus group discussions with people who are blind or have low vision;
- Telephone and email interviews with disability organisations;
- A public online consultation, conducted between September and October 2009 and attracting 38 submissions;
- Interviews with vendors and Australian resellers of the common assistive technologies used;
- An analysis of comparable international survey data on the use of screen readers;
- An analysis of supporting technical documentation provided by vendors;
- A series of 43 technical tests on each assistive technology to determine its level of interaction with the PDF file standard identified by Adobe; and
- A series of 245 user experience tasks across a group of 23 participants on a sample of 8 PDF files.

### **Focus groups**

Vision Australia conducted three focus groups between 28 September and 1 October 2009 in New South Wales, Queensland and Victoria. They included 22 people who are blind or have low vision and use assistive technologies. Most participants use multiple adaptive strategies, depending on their situational context. These are outlined in Table 9: Adaptive strategies and assistive technologies used. Participants for each session were recruited against predetermined demographic profiles which included their gender, age, type of disability, the assistive technology they used and their level of skill in using their assistive technologies. A Vision Australia consultant facilitated the 80 minute focus groups. A scribe and digital recording equipment were used to capture the feedback for further analysis.

Table 9: Adaptive strategies and assistive technologies used

Adaptive Strategies	AT Device	Total Users
Braille Notetaker	BrailleNote	4
	PAC Mate	1
Daisy Player	VictorReader Stream	2
Screen Reader	JAWS	19
	System Access (SATOGO)	3
	VoiceOver	1
	Window-Eyes	3
Screen Magnifier	MAGic	3
	ZoomText	4

### Telephone interviews and email correspondence

Telephone interviews and email correspondence were undertaken with disability organisations supporting people who are blind or have low vision between April 2009 and February 2010 to establish the most common assistive technologies, and their versions, used by clients.

Contact with clients was facilitated through: Vision Australia; the Association for the Blind of WA – Guide Dogs WA; Royal Society for the Blind of South Australia; Royal Institute for Deaf and Blind Children; Retina Australia; Women with Disabilities Australia; Network of Disability Officers ; Blind Citizens Australia (email list); and Vision Impaired People’s Information List in Australasia (email list).

### Online consultation

The public consultation ran from 16 September until 26 October 2009. Consultation Guidelines were published on the [Web Publishing Guide](#). The consultation was promoted through the AGIMO web manager community, an external email distribution list “Web Standards Group”, with peak disability bodies, web developers and accessibility consultations and on the Department of Finance and Deregulation website.

In total, 38 submissions were made. Of those, four were conducted via a telephone interview, three were made anonymously, and the remaining 31 were written submissions either emailed or sent via post. Approximately half of the submissions were made on behalf of businesses or organisations (such as Peak Disability Bodies), the others were personal accounts.

## Technical evaluation

### Vendor interviews

Interviews with vendors or Australian resellers were conducted between October 2009 and February 2010. Organisations participating included HumanWare, Quantum Technology (on behalf of Freedom Scientific), NV-Access, Serotek, Apple, GW Micro and Ai Squared.

### Technical testing

The technical test suite used was created by Adobe. It included 43 specific tests pertaining to the WCAG 2.0 Success Criteria. Success Criteria that were considered to have no impact on the support of the PDF format for accessibility were excluded from the tests. For example, Success Criteria 1.4.3 *Contrast (minimum)* was considered, by Adobe, to be a requirement of the document author not the format itself.

Adobe determined the characteristics within a specific Success Criteria that warranted testing, as there is no defined list yet available for PDF. For example, for Success Criteria 1.3.1 (*Info and Relationships*) paragraphs, headings, controls and input elements are tested, but special presentations of text (bold, italicised) and mark-up of tables are not tested.

A test suite containing 22 PDF files was created to ensure only the specified set of behaviours of the 43 tests was evaluated. Each test file replicated specific behaviours or elements of a PDF file requiring testing. Some test files applied to more than one test, for example Test File 6 contained a list of textual headings (h1 through to h6) with appropriate PDF tags applied. Test File 6 was therefore used to conduct the following tests as it presented the required behaviours of each:

- Headings are identified by speech assistive technology (Success Criteria 1.3.1)
- Headings allow skipping around in documents (Success Criteria 2.4.1)
- Headings are identified (Success Criteria 2.4.10)
- The name, value, and role is available for headings (Success Criteria 4.1.2)

The test suite does not take into account usability functions of assistive technologies not covered by WCAG 2.0. For example, identification of paragraphs is included (Success Criteria 1.3.1), but navigating by paragraph is not a requirement under a WCAG 2.0 Success Criteria and therefore is not included.

Testing was conducted by Adobe, replicating the methodology used in the original 2008 and 2009 tests. It is summarised as:

- The individual test file is opened in Adobe Reader on a Windows PC or in Preview on an Apple Macintosh;
- The tester uses the particular assistive technology to attempt to satisfy the test case; and
- The outcome is recorded and additional comments describing the behaviour experienced are provided, where required.

## User experience evaluations

Twenty-three user experience evaluations were undertaken on eight PDF files by people using different adaptive strategies. Evaluations were conducted at either a Vision Australia office, or in the participant's home or place of work, due to their disability, technical requirements or availability.

A pilot evaluation was conducted on 19 February 2010 to test and refine the methodology. Formal evaluations were conducted between 22 February and 23 March 2010.

Evaluations took up to two hours: 30 minutes provided for pre- and post-evaluation interviews and up to 90 minutes for user testing. A sample of PDF documents was prepared (Collection A & B) and six tasks were presented to the participants using Collection A, followed by six tasks in Collection B. Tasks were presented to the participants in a randomised order to reduce the impact of any learning curve as a result of specific document types following one another.

### Data recorded

An evaluator from Vision Australia facilitated each of the sessions and recorded both qualitative and quantitative data including:

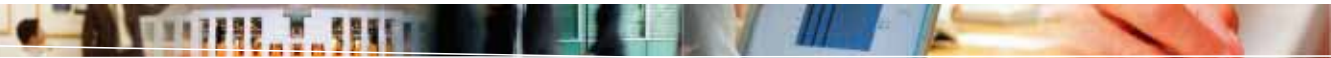
- Description of usability and accessibility issues encountered;
- Cause of usability and accessibility issues encountered;
- Comments made by the participant as they attempted the task;
- Approach the participant applied to the task (e.g. navigation style);
- Cause and timing of any confusion the participant expressed, where relevant;
- If task was successfully completed;
- Whether the participant considered the time taken to complete the task was acceptable; and
- How easy the participant considered it to complete the task on a scale of 1 to 7 (1 being not at all easy and 7 being very easy).

Profiles of participants included:

- 10 people who are blind and used a screen reader;
- 1 Deafblind user using a combination of screen reader/braille display and visual inspections;
- 5 people who have low vision and use screen magnification;
- 3 users who have mobility impairment, each using different adaptive strategies;
- 3 users who have cognitive impairment; and
- 1 user with a hearing impairment whose first language is Auslan.

Users with different skill/experience level were also recruited, particularly for screen reader users. Experience or skill level had been highlighted as a factor that impacted on participant's ability to use PDF files during the user consultation sessions. Participants were selected so as to ensure a mix of age and gender. A full listing of the participants is included in the Supplementary Report.

# Appendix



# Appendix

## ***Submissions to the public consultation***

### ***Individuals***

**15**

Andrew Devenish-Meares  
 Anonymous (3)  
 Candace Driscoll  
 Gaelian Ditchburn  
 Gian Wild  
 Hannen Abdallah  
 Ingrid Hindell  
 Nicholas Thiele  
 Peter Greco  
 Ramona Mandy  
 Roger and Paula Swift  
 Tom Worthington  
 Val Johnston

### ***Organisations***

**19**

Adobe Systems Incorporated  
 Australasian Network of Students with Disabilities  
 Australian Catholic University  
 Australian Communications Consumer Action Network  
 Australian Federation of Disability Organisations  
 Blind Citizens Australia  
 Cerebral Palsy League of Queensland  
 Disability Service Commission (Western Australia)  
 Guide Dogs SA & NT  
 Image Innovation  
 La Trobe University (2)  
 Media Access Australia  
 OPC IT  
 Royal Society for the Blind (SA)  
 Simius Web Ltd  
 Universitat de Barcelona  
 Web Usability  
 Women with Disabilities Australia

### ***Government organisations***

**4**

Department of Defence  
 Department of Defence, Defence Material Organisation (DMO), Office of Special Counsel  
 Department of Resources, Energy and Tourism (DRET)  
 NSW Department of Education and Training

***Organisations providing assistive technology data***

To determine the most common assistive technologies in Australia, representatives from the following organisations provided their insights:

- Vision Australia (New South Wales, Victoria and Queensland)
- The Association for the Blind of WA - Guide Dogs WA
- Royal Society for the Blind (South Australia)
- Royal Institute for Deaf and Blind Children
- Retina Australia
- Women with Disabilities Australia
- Network of Disability Officers

In addition, postings were placed on the Blind Citizens Australia and Vision Impaired People's Information List in Australasia. The posts asked the members what version of assistive technology and browser they used to access the web. Twenty-one responses were received.

## **Glossary**

### **Accessibility Supported**

To qualify as a W3C 'Accessibility Supported' technology the technologies must first "be designed in a way that user agents including assistive technologies could access all the information they need to present the content to the user. Secondly, the user agents and assistive technologies may need to be redesigned or modified to be able to actually work with these new technologies."

<http://www.w3.org/TR/UNDERSTANDING-WCAG20/conformance.html#uc-accessibility-support-head/>.

### **ARIA – Accessible Rich Internet Applications**

Web Accessibility Initiative Accessible Rich Internet Applications Suite (WAI-ARIA) defines a way to make Web content and Web applications more accessible to people with a disability. It especially helps with dynamic content and advanced user interface controls developed with Ajax, HTML, JavaScript, and related technologies.

<http://www.w3.org/WAI/intro/aria.php/>.

### **Assistive technology**

Assistive technologies are products used by people with a disability to help accomplish tasks that they cannot accomplish otherwise or could not do easily otherwise. When used with computers, assistive technologies are sometimes referred to as adaptive software or hardware.

Some assistive technologies are used together with graphical desktop browsers, text browsers, voice browsers, multimedia players, or plug-ins. Some accessibility solutions are built into the operating system, for instance the ability to change the system font size, or configure the operating system so that multiple-keystroke commands can be entered with a sequence of single keystrokes.

<http://www.w3.org/WAI/EO/Drafts/PWD-Use-Web/>.

### **DAISY**

Developed by the DAISY Consortium, the Digital Accessible Information System (DAISY) is a digital format that assists people that have challenges using regular printed media. DAISY digital talking books offer the benefits of regular audio books, but include navigation based on the structure of the file. DAISY requires a specialised software or hardware player to access the content.

<http://www.daisy.org/>.

## Sufficient Techniques

Sufficient Techniques provide guidance and examples for meeting WCAG 2.0 guidelines using specific technologies. These techniques have been considered satisfactory by the WCAG Working Group. Multiple Sufficient Techniques may be listed for a success criterion and any listed technique can be used to meet the success criterion. This list is not exclusive and there may be other techniques that can also be used to meet a success criterion.

<http://www.w3.org/TR/WCAG-TECHS/intro.html/>.

## Success Criteria

Testable success criteria exist under each WCAG 2.0 guideline. These statements are technology independent and specify the requirements for conformance to WCAG 2.0. In order to meet the needs of different groups and different situations, success criteria are grouped into three levels of conformance: A (lowest), AA (medium) and AAA (highest).

<http://www.w3.org/TR/WCAG20/>.

## WCAG 2.0

The Web Content Accessibility Guidelines (WCAG) explain how to make web content accessible to people with a disability. Version 1.0 of WCAG (WCAG 1.0) was published in May 1999. WCAG 2.0 was published on 11 December 2008. According to the W3C, WCAG 2.0 applies broadly to more advanced technologies; is easier to use and understand; and is more precisely testable.

In February 2010 the Australian Government endorsed WCAG 2.0 and in June 2010 issued the *Web Accessibility National Transition Strategy* outlining how government websites in Australia should progress their conformance to WCAG 2.0.

WCAG 2.0 has 12 guidelines that are organised under 4 principles: perceivable, operable, understandable and robust. For each guideline there are testable success criteria, which are at three levels: A, AA and AAA. Sufficient and advisory techniques have been developed for specific technologies and provide guidance on how to meet the WCAG 2.0 success criteria.

<http://www.w3.org/WAI/intro/wcag.php/>.

