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Website accessibility in Australia and the national transition strategy: Outcomes and findings

Vivienne Conway
Edith Cowan University

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Edith Cowan University

**Website Accessibility in Australia and the National Transition
Strategy: Outcomes and Findings**

This thesis is presented for the

Degree of Doctor of Philosophy

By

Vivienne Conway

Principal Supervisor: Dr Justin Brown

School of Computer and Security Science

Faculty of Health, Engineering and Science

Edith Cowan University, Western Australia

USE OF THESIS

The Use of Thesis statement is not included in this version of the thesis.

ABSTRACT

In the most recent statistics, published by the Australian Bureau of Statistics in 2012, it was reported that slightly under one in five people stated they had a disability. A further twenty-one percent of the population (4.7 million people) reported that they had a long-term health condition that did not restrict their everyday activities. This total group of people who suffer either a disability or a long-term health condition numbers 8.9 million people, or over thirty-nine percent of the Australian population. Of the people reporting a disability, 3.7 million or eighty-eight percent of that group experienced limitations in the activities of self-care, mobility or communication, or were restricted in their education or employment. (W3C, 2013c)

In 2010, the Australian Government Information Management Office (AGIMO) reported that an estimated one in five Australians or 3.95 million people experienced long term impairment. Of this figure, 2.6 million, or roughly fifteen percent of the population, of people with long term impairments are under the age of 65. At that time it was stated that eighty-six percent report that they experience a core limitation, which involves their mobility or communication and may restrict either their schooling or employment. (Australian Bureau of Statistics, 2010; Begbie, 2010) According to these figures, it would appear that the number of people with disabilities that restrict their daily lives has grown in line with population growth.

In June 2010, the Australian Government released the *Web Accessibility National Transition Strategy (NTS)* (Australian Government Information Management Office (AGIMO), 2010a). This document outlines the plan for the adoption and implementation of the *Web Content Accessibility Guidelines (WCAG) Version 2.0 (W3C, 2008d)*. This plan provides a strategy for all government websites to conform to *WCAG 2.0* Priority Level A by December 2012 and Australian Government sites to *WCAG 2.0* Priority Level AA by December 2014.

In Australia, the Australian Human Rights Commission (AHRC) is responsible for administering the *Disability Discrimination Act of 1992 (DDA)* (Australian Government, 2013a). In order to assist organisations in complying with the *DDA*, the AHRC has produced the *World Wide Web Access: Disability Discrimination Act Advisory Notes Version 4.0 (Advisory Notes)*. (Australian Human Rights Commission, 2010). These *Advisory Notes* reinforce the *NTS*, but also advise all non-government website holders to ensure their websites are compliant to *WCAG 2.0 (W3C, 2008d)*. New non-government websites must adhere to *WCAG 2.0* AA, and existing website owners have until December 31, 2013 to comply with this same level. (Australian Human Rights Commission, 2010)

Australians have clearly embraced using the Web as their preferred method of dealing with the various levels of government. It is estimated that there are over 4600 registered domains in the gov.au space, with more than 4.2 million documents. Australians enter the federal government web space through 'www.australia.gov.au' which has led the transition to *WCAG 2.0* by declaring their site compliant to *WCAG 2.0*

AA, with some elements complying with the AAA level. (Australian Government Information Management Office (AGIMO), 2009)

The purpose of this research was to determine whether such a mandated approach by way of a federal government strategy would accomplish the goal of achieving compliance with *WCAG 2.0*. In order to accomplish this research goal, a selection of websites from government websites was assessed on a regular basis to observe their accessibility changes during the period of the *NTS*. In addition, this study included websites from non-government sites in order to observe their accessibility changes and also to compare these results with the government website results. The websites were selected in a targeted sample approach in an attempt to choose websites that would enable comparison of the accessibility results. For instance, the same category of websites from each state was selected including the state library, health, disability services, job search, emergency services and business development. Federal government websites were chosen to reflect these same categories plus additional websites with which it was considered Australians had the most contact, including but not limited to broadcasting, tax, health, and information services. The not-for-profit websites chosen represented those considered most well-known, while those selected for the government-affiliated category included a university from each state plus two utilities. The corporate website category included representatives from large corporations such as banks, airlines, mining companies and major shopping as well as representatives selected from organisations such as telecommunications, travel, public transportation, telecommunications and multimedia. In the local government category, the capital city and next largest city in terms of population was chosen from each state. The selection of websites was done in consultation with academic supervisors, members of the W3C as well as in consultation with staff at the Australian Government Information Management Office.

Barriers in achieving compliance with *WCAG 2.0* and critical success factors for those organisations which achieved the greatest level of compliance were identified both through the evaluation data and also through the surveys conducted throughout the research. The lack of a unified methodology for testing the websites for accessibility was highlighted as an area which needs to be addressed if the Government is to be able to conduct checks on agencies to monitor their progress toward achieving compliance with these accepted standards.

The results of this research demonstrate that very few organisations succeeded in meeting even Level A of *WCAG* by the deadline of December 31, 2012. It is clear however that the government websites achieved greater compliance scores than non-government. In particular, the federal government websites both started as the most accessible and retained that position to the end of the data collection period.

While very few websites in this research were successful in achieving compliance with *WCAG 2.0* to even Level A, the *NTS* was successful in the raising of awareness of the issues and requirements of website accessibility, particularly for government agencies. Conversely, this means that the gap between the accessibility of

government and non-government websites has widened which is clearly demonstrated by the results of this research.

DECLARATION

I certify that the thesis does not, to the best of my knowledge and belief:

- (i) incorporate without acknowledgement any material previously submitted for a degree or diploma in any institution of higher degree;
- (ii) contain any material previously published or written by another person except where due reference is made in the text; or
- (iii) contain any defamatory material.

Signed

Date 19 September, 2014

ACKNOWLEDGEMENTS

To my principal supervisor, Dr Justin Brown, I offer my sincere appreciation for his inspiration. Without Justin's encouragement, I would never have commenced this project, and would certainly never have thought it even a possibility. Justin has stuck by me throughout the process even when I thought it was never going to reach completion. I feel very honoured that Justin agreed to act as my supervisor. He met me as an undergraduate in his markup languages class and his unfailing patience with my desperate and feeble attempts to understand the intricacies of HTML gave me the courage to attempt to do more. Justin also supervised me through my Honours Degree which inspired me to attempt this last academic journey.

The Digital Accessibility Centre in South Wales, UK performed the professional user testing for this research project in the middle of their own hectic schedules. This group of user testers were willing to test all 138 of the websites and did so without a single complaint. I am so thankful to Cam Nicholl, Gavin Evans and the whole team for their support – you guys are the greatest!

I owe a great deal of gratitude to my friends who have completed their doctorates and were unfailingly encouraging. Dr Janette Ring was always there to lend an encouraging word and offer advice, especially when I felt like giving it all away. Dr Judith Clayden, your editorial assistance was incredible, thank you so much for this and your encouragement.

Thanks also to Dr Nattakant Utakrit for her invaluable assistance in understanding and applying the statistical analysis so necessary with the massive amount of data that I collected. You truly saved me from giving it all away when it seemed my brain could not cope.

Finally to the valiant warriors in the fight to bring about website accessibility, I offer my thanks for your help with my questions and concerns. I have asked so many questions and received such wonderful support from you all. This is your work too.

DEDICATION

I would like to dedicate this thesis to the incredible people with disabilities who daily deal with the issues that I address in this thesis. While I tried to understand the difficulties you face, I fear I have only touched the tip of the iceberg. Your bravery and determination inspire me always. I can only hope that this helps you in some small way. Let's hope that the issues of website accessibility are embraced by more organisations and that it makes your daily lives just a little bit easier. If that happens, I will have achieved my purpose.

To my incredible family, husband Bill, my children and their spouses Rebecca and Shannon, Jason and Kathryn, and Emma and my incredible grandchildren, your tolerance and support amaze me. Even when you knew I was really struggling with this burden you kept me encouraged and inspired. You really 'got' what I was trying to achieve. I know that I have been a source of incredible frustration to you all during this journey and I promise never to do this again! If I bring up the topic, just nod and walk away slowly. How you have managed to put up with me through this, I'll never know. Your love and support keep me going. Perhaps now life will resume some normalcy.

Finally, to my friends who I have so sorely neglected throughout this journey, I offer both my thanks and apologies. Thanks for understanding and being so patient. The apologies are for neglecting you so dreadfully over the past years while I worked from my undergraduate studies right through to this doctorate. It has been a long journey, but you have been content with just the occasional call or visit and have always been ready with a word of encouragement and an occasional glass of vino to help me get through it all. Emjays, you will probably never know how my one day out each month with you kept me sane.

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1 INTRODUCTION

1.1 INTRODUCTION TO THE STUDY

In 2010, it was estimated that one in five Australians, or 3.95 million people, experienced long term impairment. At that time, the Australian Government Information Management Office (AGIMO) reported that 2.6 million, or roughly fifteen percent of the population, with long term impairments were under the age of 65. Of these, eighty-six percent reported that they experienced a core limitation, which affected their mobility or communication and restricted either their schooling or employment. (Australian Bureau of Statistics, 2010; Begbie, 2010) In 2013 the Australian Bureau of Statistics (ABS) released updated figures that demonstrate there are still just slightly less than one in five people (4.2 million or 18.5% of Australians) with a disability. The ABS further stated that there are an additional 4.7 million people (21%) who state they have a long-term health condition that did not stop them from performing their daily activities. This amounts to almost 40% of the Australian population. Of the people who report they had a disability (18.5% of Australians), 88% of these state that their limitation or restriction meant they were limited in their ability to carry out the core activities of self-care, mobility or communication, or were restricted in education or employment. (W3C, 2013c)

Tim Berners-Lee, W3C Director, and credited with inventing the World Wide Web (Web), states “The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect” (W3C WAI, 2009). To people with disabilities, the invention of the Web presents an opportunity to participate more fully in their community. The *United Nations Convention on the Rights of Persons with Disabilities* which has been ratified by Australia (United Nations, c2008), and the Australian Human Rights Commission which implements the *DDA (W3C)* both support the vision of creating inclusive communities where all people are able to participate, having the same ability to access information. People living with all types of disabilities can benefit from participating in activities involving the Web. In particular, attention has been given to people with visual disabilities, including blind and partially-sighted individuals. These individuals now have the opportunity to access the Web for everything from important government information to their daily shopping and banking. However, many services both government and commercial do not have websites that are accessible to people with disabilities. Brajnik (2008) states that a website is accessible when “specific users with specific disabilities can use it to achieve specific goals with the same effectiveness, safety and security as non-disabled people.”

In June 2010, the Australian Government released the *Web Accessibility National Transition Strategy (NTS)* (Australian Government Information Management Office (AGIMO), 2010a). This document outlined the plan for the adoption and implementation of *Web Content Accessibility Guidelines (WCAG) Version 2.0*. This plan

provided a strategy for all government websites to conform to WCAG 2.0 Priority Level A by December 2012 and Australian Government sites to WCAG 2.0 Priority Level AA by December 2014. The initial plan focuses particularly on federal government websites. Other levels of government were encouraged to follow the strategy, and most of the states and territories affirmed they planned to do so, as indicated in Figure 4-7. (Zugang für alle, 2009) Final compliance checks will be completed by the end of the first quarter of 2015.

Accessibility of all Australian websites is governed by the *Disability Discrimination Act (DDA)* and administered by the Australian Human Rights Commission (Australian Government, 2013a). The latest version of the Commission's *Advisory Notes, Version 4.0* was published in October 2010. The *Advisory Notes* reinforce the *NTS*, but also advise all non-government website holders of the requirement to ensure compliance to WCAG 2.0. New non-government websites must adhere to WCAG 2.0 AA, and existing website owners had until December 31, 2013 to comply with this same level. (Australian Human Rights Commission, 2010)

Australians have clearly embraced using the Web as their preferred method of dealing with the various levels of government. It is estimated that there are over 4600 registered domains in the gov.au space, with more than 4.2 million documents. Australians enter the federal government web space through www.australia.gov.au which has led the transition to WCAG 2.0 by claiming its site is compliant to WCAG 2.0 AA; also stating that some elements comply with the AAA level. (Australian Government Information Management Office (AGIMO), 2009)

It was expected that the *NTS* would provide a fresh impetus to improve the accessibility of all government websites (Luxton, 2011). In Australia, there are legislative instruments which cover the necessity to ensure website accessibility; these include the *DDA*, the *United Nations Convention on the Rights of People with Disabilities*, and the anti-discrimination laws of the individual state governments. These documents relate to every person in Australia. The *NTS* is the vehicle that has been developed to provide a way to ensure a coordinated, consistent transition to WCAG 2.0 Priority Level AA for government departments and agencies. AGIMO, as a government body, has the authority to require compliance with the *NTS* and the means to complete the necessary compliance checks by 2015. As Stewart Luxton from the Public Service Commission in Western Australia states:

There has never been such impetus and drive to get awareness of this strategy out there and make sites accessible. Not only that, but the *NTS* is a well thought out plan that understands the issues agencies will face and helps them with realistic timeframes, a staged approach and a dedicated team in AGIMO (albeit far too small) to provide assistance. The time is now, let's hope we grab it (Luxton, 2011).

1.2 STATEMENT OF THE PROBLEM

In June 2010, the Australian Government introduced the *NTS*. This strategy was designed to assist government bodies to update websites so that they conform to *WCAG 2.0*. Federally-funded sites needed to conform to Level A by December 2012 and AA by December 2014, while states or territories and local government agencies must conform to *WCAG 2.0* Level A but are not mandated to follow the strategy of the *NTS*. These government bodies are encouraged to conform to the higher Level AA standard. (Australian Government Information Management Office (AGIMO), 2010b)

The *NTS* provides a unique opportunity to observe, in a large case study, the efforts of government organisations as they work toward up-grading websites to internationally recognised standards for accessibility.

A further problem is related to governance of website accessibility for non-government websites, as well as those government websites, out of the control of the *NTS*, who fall under the Australian Human Rights guidelines. At this point, there does not appear to be a strategy for compliance checks for non-government website accessibility. Compliance checks for these websites appear to take place on an ad hoc basis when a complaint is made to the Australian Human Rights Commission under the *DDA*. (Australian Human Rights Commission, 2010; W3C)

1.3 BACKGROUND TO THE STUDY

This research project was inspired in part by an earlier investigation of the accessibility of public library websites in Western Australia (Conway, 2010). In that research, it was assumed that a good test case for website accessibility would be public libraries as they are the closest point for obtaining information for most citizens in Australia. This is especially significant, considering that public library information is free, and many people with disabilities may be financially-disadvantaged due to the need to purchase purpose-designed software and equipment (Purdie, Kellett, & Bickerstaffe, 2012; Sciulli, Gomes de Menezes, & Vieira, 2011; Seipel, 1994). Public libraries in Western Australia are operated by local governments, and their websites each form part of a local government website. The findings from that research suggested that none of the public library websites in Western Australia met the criteria for website accessibility defined by *WCAG Version 2.0*. A similar study was conducted in Florida by another researcher to evaluate its public libraries there. While that study relied solely on an automated tool, and assessed only the home page to the *Section 508 amendment of the United States Rehabilitation Act of 1973* (United States Government, 2014), the results were very similar; there was a very low rate of website accessibility standards compliance, as well as a lack of understanding of the requirements for accessibility and the importance of the issue. (Brobst, 2009)

The Australian Government has recognised the need for a strategy to bring government websites into line with recognised international standards, hence the *NTS*. The Australian Government has endeavoured to demonstrate its commitment to website accessibility by working toward *WCAG 2.0 AA* with the entry portal to the e-government site, Australia.gov.au.

As all Australian websites are now required to conform to either the *NTS* or the *Australian Human Rights Commission Disability Discrimination Act Advisory Notes Version 4*, (Australian Human Rights Commission, 2010) this study was designed to document the effects of the *NTS* strategy and compare the results with those of the general population of websites. For this reason, specific websites were selected as a target group for this study from all levels of government, as well as government-affiliated, not-for-profit, and corporate websites that affect citizens most, such as those of banking, real estate, tourism and large corporations. The websites which comprise the target group and the rationale for their inclusion are discussed in Chapter 3.2.2

1.4 PURPOSE AND RATIONALE OF THE STUDY

The purpose of this research was to conduct a case study that would observe and document the transition of government and non-government websites in Australia to compliance with the *WCAG 2.0* standard.

This research is more than a point in time documentation, as it documents the positive and negative findings of the case study, and presents qualitative data obtained from interviews and surveys conducted with participating website managers. It is envisioned that the information derived will assist website developers and managers in assessing the accessibility of their websites and also in planning for future web development projects.

1.5 DEFINITION OF TERMS

Documentation and processes in the field of the Internet and websites in general are rife with acronyms and sometimes confusing terminology. A list is provided here of the most common terms their acronyms and meanings, as used in this research.

- **Accessibility:** This is often described as usability for people with disabilities. The W3C Web Accessibility Initiative (WAI) defines web accessibility to mean “that people with disabilities can perceive, understand, navigate, and interact with the Web, and that they can contribute to the Web. Web accessibility also benefits others, including older people with changing abilities due to aging.” (W3C, 2005)
- **Accessible Web Design:** The Australian Human Rights Commission defines accessible web design as “the philosophy and practice of designing web content so that it can be navigated and read by

everyone, regardless of location, experience, or the type of computer technology used.”(Australian Human Rights Commission, 2010)

- **Disability:** The definition provided by the *DDA* includes “physical, intellectual, psychiatric, sensory, neurological and learning disabilities as well as physical disfigurement and the presence in the body of disease-causing organisms” and covers disabilities they may have now, have had in the past, or may experience in the future (e.g. genetic predispositions).(Australian Human Rights Commission, 2010; W3C)
- **Standards:** a set of guidelines, usually nationally or internationally-recognised that prescribe a required level of compliance, e.g. those maintained by the International Standards Organisation (ISO).
- **Universal resource locator (URL):** a website’s address
- **Web Accessibility Initiative (WAI):** The WAI is a division of the W3C headed by Tim Berners-Lee with the express purpose of working toward universality of access to the W3C (W3C WAI, 2009)
- **Web Content Accessibility Guidelines (WCAG):** internationally-accepted standard for website accessibility – see Chapter 2, Literature Review for a discussion of these guidelines. The current version of these guidelines is known as *WCAG Version 2.0* (W3C, 2008d)
- **Webpage / Website:** a site or location on the World Wide Web that may be either a single page, an entire site, and includes Internet, extranet (information available to selected persons or companies) or intranet (available to permitted individuals within a company or organisation only)
- **Website:** an address (URL) on the www used as an access point to commercial, government or private information
- **World Wide Web (WWW)** is the graphic user interface (GUI) that sits on top of the Internet, facilitating the use of and transfer of documents. It was created in 1989 by Tim Berners-Lee who is now the director of the W3C.
- **World Wide Web Consortium (W3C)** is a group of international experts who work together to develop standards to ensure the continued growth of the WWW (World Wide Web Consortium (W3C), 2009).

1.6 STATEMENT OF THE RESEARCH QUESTION

The principal research question has been designed as an over-arching statement against which the supporting questions will provide findings.

How effective is the government-mandated web accessibility strategy, The National Transition Strategy, in bringing about compliance with WCAG Version 2.0 for a sample of sites identified as required to meet WCAG standards within a specified time?

The fact that the *NTS* contains a work plan designed to assist agencies to achieve their accessibility goals is admirable. However, ascertaining the success of this plan is crucial to being able to determine the extent to which the website owners and developers in Australia meet the goal of having truly accessible websites.

While assessing the outcomes of the *NTS*, other information critical to informing future website accessibility work has been collected. Some of the questions critical to this aim are provided below.

1.6.1 SUPPORTING QUESTION ONE

The research plan involves assessing one hundred thirty eight websites on a regular basis. As highlighted in the introduction, all websites in Australia are covered by the *DDA* with the *NTS* applying directly to government websites. Including non-government websites will allow a comparison to be made of the website accessibility of all levels of government as well as government-affiliated, not-for-profit and corporate websites.

Six categories of websites studied in this research have been divided into two sub-categories: government and non-government. The government sub-category includes federal government websites that are mandated to follow the *NTS*, state or territory and local government websites that must reach *WCAG 2.0* but have options including the method of achieving those goals outside the *NTS*, and government-affiliated websites which are included as they receive government funding. The non-government sub-category includes not-for-profit and corporate websites which are mandated by the *DDA* and administered by AHRC to attain *WCAG 2.0* standards but have a choice of mechanism for achieving that goal (Australian Human Rights Commission, 2010; W3C)

Supporting question one examines whether the type of organisation makes a difference in the level of website accessibility and the level of influence the *NTS* has exerted. For example, does the fact that the federal government websites have different compliance enforcement methods mean that they were more or less likely to reach *WCAG 2.0* AA compliance? Are the corporate websites that experience a greater degree of public interest working toward website accessibility targets, and have the tenets of the *NTS* influenced their site designs? Conversely, are websites of not-for-profit organisations likely to have more difficulties reaching accessibility targets due to funding difficulties, or are those associated with disability groups more likely to be accessible because of the population they principally serve?

Supporting question one:

Does the type of organisation play a role in the demonstrated levels of compliance, the time it takes to reach that level and the obstacles faced in achieving this level of compliance?

1.6.2 SUPPORTING QUESTION TWO

Supporting question two aims to discover the most important elements in a successful website evaluation method. Analysis of the data collected from surveys will consider opinions of the *NTS* and whether this strategy has motivated website owners or managers to work toward website accessibility. Exploration of the problems encountered in building *WCAG 2.0* compliant websites will be of immense benefit to future website developers and those who need to make corrections to existing websites. Chapter 3 deals with methods and describes more fully the aspects of the study that will assist in understanding these key elements.

Supporting question two:

What are the key elements of a website accessibility evaluation methodology?

1.6.3 SUPPORTING QUESTION THREE

The observation of this sample of websites in a longitudinal study provides data indicating which websites achieved *WCAG Version 2.0* compliance. Quantitative data obtained from the website audits determined the level of website accessibility at regular intervals. The data for each web page assessed was fed into a reporting structure which was averaged for the five pages assessed and then used to produce an aggregated score for the website. At the end of the data collection period, a final website audit determined each website's accessibility as it related to the *WCAG 2.0* standard.

While the website accessibility audits were designed to determine the state of the websites' accessibility compliance at different points in time, the surveys were planned to discover additional qualitative data to assist in determining which factors influence compliance success.

Supporting question three:

What are the critical success factors for organisations that achieve compliance with WCAG 2.0 A or AA?

1.6.4 SUPPORTING QUESTION FOUR

In the literature review, different studies highlight obstacles faced in achieving website accessibility. The barriers of time, cost, management support, technical ability, and changing technical requirements are often stated to be the most common obstacles in meeting accessibility goals. This research documents through the surveys the actual obstacles identified, as well as the manner in which the obstacles are met. Identifying

common obstacles, and how they have been overcome or dealt with, will assist other groups facing similar problems. This research identifies successful methods for evaluating website accessibility, thereby alleviating the necessity to 're-invent the wheel'.

Supporting question four:

What are the obstacles faced by organisations in achieving mandated website accessibility compliance?

1.7 SIGNIFICANCE OF THE STUDY

The literature review highlights studies conducted in a number of countries including the Czech Republic, Korea, Saudi Arabia, Sweden, the United Kingdom and the United States. *WCAG Version 2.0* has been well accepted as an international standard, though not without some criticism. Perceived shortcomings in *WCAG 2.0* are discussed in the literature review under the section on the W3C. There appears to be a lack of studies demonstrating how *WCAG Version 2.0* has been implemented, including the methods of enforcement and/or encouragement given to agencies in achieving compliance with this standard. There is criticism of the lack of analysis of the different methods of evaluation with *WCAG Version 2.0*, which was designed to be more testable than its predecessor, *WCAG Version 1.0* (W3C, 2009c).

This research:

- Assesses the Australian efforts to bring government websites into compliance with *WCAG 2.0 AA* in a planned, supported manner;
- Assesses how other organisations, also mandated to achieve compliance with the same standard, do so outside the *NTS*;
- Observes through a longitudinal study the transitions of websites toward accessibility compliance by the different categories of websites studied;
- Determines critical success factors for organisations achieving website accessibility compliance;
- Observes common obstacles in achieving website accessibility compliance and document the methods for dealing with these obstacles; and
- Determines key elements of a web accessibility evaluation methodology.

1.8 ORGANISATION OF THIS THESIS

The introduction to this thesis has provided a background to the current situation in Australia in relation to website accessibility and a rationale for this study. The principal and supporting research questions have been explained in this section. Chapter 2 contains the literature review which outlines the existing studies on website accessibility. Considerable attention has been given to studies undertaken in different countries to provide context to the Australian Government's strategy to achieve website accessibility compliance. The literature discussed provides an analysis of the problems being faced by website users, considers various methods for assessing website accessibility, and offers statistical data about the current state of website accessibility around the globe. This material provides justification for the Australian Human Rights Commission and Australian Government's ambitions to improve significantly the state of website accessibility in Australia.

Chapter 3 deals with the methods and mechanisms that have been used to conduct this research. It provides a detailed description of a hybrid method of website accessibility audit, including the tools used, the frequency of the audits and other research tools, including surveys.

Chapter 4 contains the quantitative results of the audits by the manual expert evaluation, user testing by people with disabilities and automated tests. The results of the qualitative data from three surveys are provided in Chapter 5.

The analysis of the significance of the results commences in Chapter 6 which includes a consideration of the critical importance of the methods selected. Issues surrounding the interaction between accessibility and usability are also included in this section. A number of trends encompassing the impact of technology upon accessibility evaluations, the changing nature of websites, methods for agency self-evaluation of websites and the role played by the *NTS*, emerged from this research.

Findings related to the specific research questions are discussed in Chapter 7, and a conclusion provided in Chapter 8.

2 LITERATURE REVIEW

2.1 INTRODUCTION TO THE LITERATURE

The literature review for this research examines studies completed in Australia and other countries in assessing their website accessibility conformance. Preliminary research outlined below shows that, while researchers in other countries have been assessing their government sites, there is little demonstration of e-government websites complying with *WCAG 2.0* Priority Level A.

In this literature review, the researcher demonstrates how website accessibility is viewed in the Australian context and provides the background to the *NTS*. In addition, issues such as the evolution of web accessibility, whether government is an effective driver of change, and the evolution of the field of web accessibility are presented for discussion. Literature in the area of web accessibility is quite broad, ranging from the technical aspects of accessibility implementation and assessment, through policy issues and report-card type research which details accessibility with specific types of websites. The subject of website accessibility covers a large range of disabilities and special needs, including how these are catered for in terms of guidelines and assistive technologies. The literature examined in this thesis is more focused on the areas of policy, guidelines, implementation and assessment, though issues of the government's role in driving change through implementation strategies is also examined. The second half of the literature review spends considerable time examining the role of accessibility evaluation methods, which have had a significant impact on the research design and data gathering aspects of this thesis. While the core accessibility literature is contained in the following sections of this chapter, relevant sources are also cited in context throughout the thesis, particularly in the discussion and conclusion chapters where the outcomes of this research are aligned with similar types of research in the accessibility field.

The literature review commences by discussing what constitutes a disability, and the responsibilities of society to accommodate the differing needs of people who must adapt their environment in order to be able to fulfil their information requirements:

Impairment is the material, bodily diversity, where people are born with, acquire, and develop particular kinds of bodies, conditions, and capacities. Disability is what happens to people with impairments in their encounters and dwelling in society and the world. It is socially created by particular relations, architectures and environments. People do not have disabilities, as they are believed to have diseases or illness. They are disabled through the way that they are treated in society (Goggin, 2009).

On July 17, 2008, Australia ratified the United Nations *Convention on the Rights of Persons with Disabilities* (United Nations Enable, 2008) which, among many other provisions, provides equality of access to information and communication technologies (ICTs).

The Convention marks a "paradigm shift" in attitudes and approaches to persons with disabilities. It takes to a new height the movement from viewing persons with disabilities as "objects" of charity, medical treatment and social protection towards viewing persons with disabilities as "subjects" with rights, who are capable of claiming those rights and making decisions for their lives based on their free and informed consent as well as being active members of society [emphasis in original] (United Nations, c2008).

2.1.1 EVOLUTION OF WEB ACCESSIBILITY

The Internet has become embedded in modern society and has grown to serve as the primary conduit for communication, information seeking, purchasing of goods and services and multimedia entertainment (Sassenberg, Boos, Postmes, & Reips, 2003). Access to the Internet platform and the services it provides can have significant impacts on the ability of individuals to function and participate within a society, and is changing economies, employment, news services and even international relations. (Chourcri, 2012.; DiMaggio, Hargittai, Neuman, & Robinson, 2001; Phillips, 2000). Given the critical role the Internet now plays in everyday life, an ability to access the online world is no longer an optional activity, but rather an essential one. In particular, as governments move to the Internet as the primary mechanism of interacting with their citizens, barriers to Internet access become barriers to government services and assistance.

At the 1994 WWW II Conference in Chicago, Sir Tim Berners-Lee presented a keynote address in which he mentioned disability access. In 1995, following this keynote address, Gregg Vanderheiden released a paper discussing how accessibility affected users with disabilities. This paper (Vanderheiden, 1995), provided the foundation of thirty-eight different guidelines, eventually consolidated into the *Unified Web Site Accessibility Guidelines* compiled by the University of Wisconsin-Madison. This was considered to be the genesis of WCAG 1.0.

According to Takagi, Asakawa, Fukuda and Maeda (2004b), it was the issue of blind access to digital information that led to the United States' *Section 508 of the Rehabilitation Act (Section 508)* being amended in 1998 (United States Government, 2014). *Section 508* provides details of the federal agencies' powers of procurement to ensure that information technology (IT) vendors deliver accessible web sites and web-based applications. Given that the World Wide Web was less than a decade old in 1998, and was still developing in terms of its societal prominence, the U.S. government recognised the importance of the World Wide Web as a communication channel and the challenges some users may have accessing it.

One of the issues noted in reviewing current literature is the concern that the increasing evolution of web-based resources from text-based static websites towards dynamic content, rich in multimedia, is making it increasingly difficult for people with disabilities to interact with the content. (Brophy & Craven, 2007)

In 2002, much of the emphasis was still on the technical nature of the Web. Boldyreff (Boldyreff, 2002) depicts a model of accessibility and evaluation as layers of the "Ramagian Onion," comprising eight layers:

Functionality: does it work?

Efficacy: does it work well enough?

Usability: Is it workable with?

Standards: Does it follow the standards laid down by various bodies?

Individual effects: what does it do to those who work with it?

Group effects: what does it do to their work?

Organisational effects: what does it do to those they work with and for?

Societal effects: what does it do to the world beyond work?

The first four layers can be further refined to the following layers: Reliability, efficiency, functionality, usability, efficacy, maintainability, and standards. Boldyreff maintains that "if a system is neither reliable nor efficient, it will be difficult to determine its functionality" (Boldyreff, 2002). In this model, the author places the standards layer at the outer of this set of eight extended inner layers. Boldyreff maintains the first emphasis on the technical nature of websites: "It is obvious that an unmaintainable system will become progressively less useful over time" He further states: "Accessibility is as much a technical issue as a social issue"(Boldyreff, 2002).

2.1.1.1 WCAG 1.0

The *Web Content Accessibility Guidelines version 1.0 (WCAG 1.0)* was the first formal attempt, beyond the earlier work of Vanderheiden, to quantify the issues of web accessibility as a series of guidelines. It was published in May 1999 through W3C WAI. According to Gonçalves, Martin, Pereira, Oliveira and Ferreira (2013), *WCAG 1.0* was the result of the early attempts by W3C WAI to create a set of tools aimed to improve accessibility of websites. The *WCAG 1.0* document was a “series of indicators gathered in a document fashion that explained how to create accessible content” (Gonçalves et al., 2013, p. 365).

WCAG 1.0 consisted of fourteen guidelines, each of which had a number of checkpoints. In addition, there were three priority levels which were used to differentiate between the most basic requirements to enable people with disabilities to use a web page through to those checkpoints that would remove the more significant barriers. *WCAG 1.0* was very technology-specific, particularly relating to HTML techniques (W3C, 2008a). This reliance upon specific technologies, rather than over-arching principles, caused *WCAG 1.0* to become out-dated. *WCAG 1.0* was seen by some of the community as too subjective, which allowed for interpretation regarding what might be considered a failure or a pass. This indecision led to difficulty for evaluators to test whether a page conformed to *WCAG 1.0*. (Gonçalves et al., 2013; W3C, 2008a)

Further, by combining *WCAG 1.0* and *WCAG 2.0*, researchers were able to identify 10% more violations compared to *WCAG 1.0* alone and 6% more compared to *WCAG 2.0* alone. There were some limitations identified in this study as there were a number of disability groups who were not included, such as people with cognitive difficulties and those who use screen magnification. It should also be noted that many of the problems that the user testers discovered were not strictly *WCAG* accessibility problems. The researchers concluded that:

... the application of *WCAG* alone is not sufficient to guarantee website accessibility. However, the application of *WCAG* is a good start for making websites accessible (Rømen & Svanæs, 2012).

Early attempts to test websites against *WCAG 1.0* involved the use of automated tools which proved to be problematic, as evidenced in the study by Jewett and Dick (Jewett & Dick, 2009). They were required by the University of California to ensure that all the information technology resources of its twenty-three campuses were accessible to people with disabilities. They found that existing testing was being done with different automated tools, which were producing different and inconsistent results.

2.1.1.2 WCAG 2.0

The problems encountered with *WCAG 1.0*, including the difficulty in testing against the fourteen guidelines, the reliance upon technology and the need for more supporting documents, led to the development of *WCAG 2.0* by the W3C WAI.

In December 2008, *WCAG 2.0* was released, as part of an international effort to “harmonize on a single standard for Web content”(W3C, 2009b). Rather than the fourteen guidelines of *WCAG 1.0*, *WCAG 2.0* groups twelve guidelines under four over-arching principles: perceivable, operable, understandable and robust (POUR). These principles are then divided into twelve *Guidelines* which provide a framework with objectives to assist authors to “understand the success criteria and better implement the techniques” (W3C, 2008c). Each guideline contains testable success criteria at three levels, A, AA and AAA. (W3C, 2008a). *WCAG 2.0* also provides sufficient techniques which are documented methods for meeting the success criteria, and advisory techniques which go beyond the requirements for the success criteria and offer authors methods to address the guidelines more effectively. In addition, *WCAG 2.0* provides documented failures which are known to cause content to fail the success criteria. The most obvious difference between *WCAG 1.0* and *WCAG 2.0* is that the latter was designed specifically to be testable with automated testing and human evaluation. Rather than take an overarching, generalised approach to guidelines, *WCAG 2.0* was designed to be more testable and to be forward-adaptable as new technologies emerge. (Gonçalves et al., 2013) In 2008, *WCAG 2.0* was approved as an ISO standard, ISO/IEC 40500:2012, which is identical to the original *WCAG 2.0* document.

WCAG Version 2.0 differs from its predecessor, *Version 1.0*, in that it has been designed to be technology-independent and consists of statements testable by either automated or manual methods. According to the W3C, “*WCAG 2.0* applies broadly to more advanced technologies; is easier to use and understand; and is more precisely testable with automated testing and human evaluation”(W3C, 2009b). *WCAG 2.0* also seeks the removal of the priority scheme that was evident in *WCAG 1.0* which gave the impression that some guidelines did not have the importance of others. (W3C, 2009b, 2014)

The techniques document (W3C, 2010c) describes methods to address the success criteria. Abou-Zahra and Cooper (2008) describe the techniques:

- Sufficient techniques – are ways for meeting the requirements of success criteria,
- Advisory techniques – are ways for further improving the accessibility solutions,
- Failure techniques – document common errors that do not meet the requirements.

In 2010, Alonso, Fuertes, Gonzalez and Martinez (2010) discussed some of the challenges in evaluating website accessibility conformance with *WCAG 2.0*. They provided a general discussion of the purpose and use of the *Guidelines*, which were designed to be a series of testable statements. Alonso et al. (2010a) list four challenges posed by *WCAG 2.0*:

- Accessibility supported technologies,
- Testability of the success criteria,
- Openness of techniques and failures,
- Aggregation of partial results.

In this research, a group of students was given a week-long intensive course in web accessibility and then asked to evaluate, against *WCAG 2.0*, a web page which had also been evaluated by experts. The findings demonstrated that only nine of the twenty-five Level A success criteria were reliably human testable. The W3C definition is that there should be an 80% success rate for the guideline to be humanly testable. The authors quote Brajnik (Brajnik, 2008) who conducted a similar experiment, producing similar results. A later study by Brajnik, Yesilada and Harper (2011) found that “an 80% target for agreement, when audits are conducted without communication between evaluators, is not attainable, even with experienced evaluators ...” This research study involved a set of experienced evaluators who worked without communicating with each other to see if they could reach 80% agreement. It also used novices to examine the same web pages: “... untrained accessibility auditors, be they developers or quality testers from other domains, would do much worse than this.” (Brajnik, Yesilada, & Harper, 2012) The results of these studies illustrate that the testability of the *WCAG 2.0* success criteria requires trained evaluators in order to provide consistent results. The difficulty in performing consistent testing against *WCAG 2.0* was also demonstrated by Alonso, Fuertes, Gonzalez and Martinez (2010) who stated that evaluators particularly struggled with the concepts of “accessibility supported technologies” (W3C, 2008b), as well as technique and failure openness and how to aggregate results.

In *WCAG 2.0*, guidelines are separated into being testable by machine or human audits. In order for a guideline to be “reliably human testable”, at least 80% of knowledgeable human evaluators must be able to reach the same conclusion. Both Brajnik et al. and Alonso et al. describe the problems encountered in testing against *WCAG 2.0* with regard to meeting the 80% agreement target (Alonso et al., 2010; Brajnik, Yesilada, & Harper, 2011).

Brajnik (2008) refers to the impact of technical accessibility testing and its relevance to usability and the *WCAG 2.0 guidelines*, stating:

Accessibility involves a wide range of disabilities, including visual, auditory, physical, speech, cognitive, language, learning, and neurological disabilities. Although these guidelines cover a wide range of issues, they are not able to address the needs of people with all types, degrees, and combinations of disability. These guidelines also make Web content more usable by older individuals with changing abilities due to aging and often improve usability for users in general (W3C, 2008d).

It should be noted that compliance with *WCAG 2.0* does not automatically preclude both accessibility and usability issues. The *WCAG 2.0* document further states:

Note that even content that conforms at the highest level (AAA) will not be accessible to individuals with all types, degrees, or combinations of disability, particularly in the cognitive language and learning areas. Authors are encouraged to consider the full range of techniques, including the advisory techniques, as well as to seek relevant advice about current best practice to ensure that Web content is accessible, as far as possible, to this community. Metadata may assist users in finding content most suitable for their needs (W3C, 2008d).

Accessibility is often described as “usability for people with disabilities” (Digital Accessibility Centre, 2013). Features which do not affect the technical accessibility of a web page may directly influence its usability for people with disabilities. For instance, there is no guidance in *WCAG 2.0* for the placement of an accessibility statement or help section, but where they are placed certainly does affect a site’s usability. To place such assistance in a footer, where the user with assistive technology may only discover it after working through an extensive list of links or reading the whole page, is one example of the need for researchers and evaluators to understand the separate issues of usability.

Rømen and Svanæs state that user testing by people with disabilities resulted in a low percentage of accessibility problems when testing in both *WCAG 1.0* and *WCAG 2.0*. These researchers state that a greater percentage of issues could be identified by combining *WCAG 1.0* and *WCAG 2.0*, due to the fact that a number of the *WCAG 1.0* checkpoints were made obsolete in *WCAG 2.0*, which is less reliant upon HTML-specific technology (Rømen & Svanæs, 2012).

An impression of the actual usability of a site may be gained in addition to specific testing against *WCAG 2.0*. Contradictions appear when, in certain cases, sites may meet *WCAG 2.0*, yet have design issues that make some of their elements unusable for individuals with certain disabilities or a combination of disabilities. Rømen and Svanæs state that it is for this reason that:

... future versions of *WCAG* should start from a usability perspective in accordance with ISO 9241-171:2008 and that WAI to a larger extent should base their guidelines on empirical data and validate them empirically (ISO, 2008; Rømen & Svanæs, 2012).

In order to understand Rømen and Svanæs' concerns-an understanding is required of the different approaches of WCAG and ISO. Gulliksen and Harker (2004) explain the differences between these standards by stating that ISO 9241, *Ergonomics of Human System Interaction*, relates primarily to user testing, whereas WCAG determines accessibility through a combination of manual inspection by experts or automated evaluation tools.

The following is an example of the WCAG 2.0 structure:

Principle 1: Perceivable – Information and user interface must be presentable to users in ways they can perceive.

Guideline 1.1 Text Alternatives:

Success Criteria: Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language (W3C, 2008c)

Sufficient Technique for 1.1.1 Non-text Content: All non-text content that is presented to the user has a text alternative that serves the equivalent purpose, except for the situations listed below. (Level A)...

Advisory Techniques for 1.1.1 – Non-text Content

Failures for SC 1.1.1 – Non-text Content

The W3C WAI, responsible for the development of WCAG 2.0, provides a *Before and After Demonstration (BAD)*. BAD provides five web pages in an inaccessible format and then provides a view of these same five pages with the accessibility violations corrected. The user is able to view these web pages with annotations explaining the problems and how they have been corrected. (W3C, 2012b)



Figure 2-1: Image from BAD Example

The image in Figure 2-1 is the banner for the home page on this website. In the inaccessible version, the alternative text for this image the source code shows:

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For the accessible version of this same page, the corrected HTML reads:

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One of the issues noted in reviewing current literature is the concern that the increasing evolution of web-based resources from text-based static websites towards dynamic content, rich in multimedia, is making it increasingly difficult for people with disabilities to interact with the content. (Brophy & Craven, 2007; Mahmud & Ramakrishnan, 2012)

2.1.1.3 BEYOND THE GUIDELINES

The next phase of accessibility appears to be moving beyond checklists of *WCAG 2.0* success criteria and towards a greater emphasis on more user-centred testing. Kelly, Sloan, Brown, Seale, Lauke, Ball and Smith (2009) propose a more holistic approach. The authors describe the “Tangram model,” which involves accessibility of learning resources. This model considers the learning outcomes rather than focussing on the accessibility of the e-learning resources, switching the emphasis from the creator of the resource to the usefulness for the end-user. Another model described by Kelly et al. (2009) is the “stakeholder model” which again shifts the emphasis from compliance with rules (e.g. *WCAG 2.0*) to meeting the needs of people with disabilities, resulting in a more contextualised model. Finally, the authors describe how these two models, Tangram and Stakeholder, can be combined. Rather than trying to decide which is best, the authors are looking at adapting testing to suit the different purposes and contexts of the websites being assessed. Finally they define *Accessibility 2.0* which displays the following characteristics:

user-focused, widening participation rather than universal accessibility, rich set of stakeholders, sustainability, always beta, flexibility, diversity, social model for accessibility, devolved not hierarchical, emphasis on policy rather than technical solutions, blended aggregated solutions, accessibility as a bazaar and not a cathedral, accessibility as a journey rather than a destination and lastly decision making by broad consensus. (Kelly et al., 2009)

The idea of moving away from a checklist mentality was suggested by Takagi et al. (2004b) when they classified website accessibility problem analysis into three categories: over-reliance on guidelines but not on real usability, reliance on syntactic checking of web pages and lack of attention on time-oriented aspects of user interaction. At that time, the authors stated that while usability testing was the most effective method for locating accessibility problems, it was too expensive to conduct on large websites, as the data analysis chapters of this thesis will attest. This led to the development of the Accessibility Designer tool, *aDesigner* which enabled a tester to visualize a blind user's usability of the website. (eclipse; IBM Research Tokyo)

In assessing how website accessibility has evolved, we look back to the case in 2002 when a legally blind user in the United States sued Southwest Airlines because he was unable to make a reservation for a flight via its website. The airline was able to make the claim, upheld by the judge, that:

Internet Web sites are not physical locations; are not "facilities" as defined in the regulations; and are not "places of public accommodation" as defined in the ADA [emphasis in original] (Hull, 2004).

It is notable that, even at the time of that ruling, the judge made a footnote that he was surprised the airline had not used every available technology to include people with disabilities and hence expand its customer base. In 2004, the United States had not developed explicit requirements for website accessibility, but was using *Section 508 of the Rehabilitation Act*, which applied at the time to Federal agencies and was expected to encompass websites. *Section 508* has now become more closely aligned with *WCAG 2.0*, a further enhancement of which is expected shortly. (United States Government, 2014). Also in 2004, Hull stated:

In short, the Web should be usable by everyone. Anyone using any technology for browsing the Web should be able to visit any site, obtain the information it provides, and interact with the site as required (Hull, 2004).

Hull also stated that website owners should be adhering to *WCAG 1.0*, which was replaced by *WCAG 2.0* in 2008. Today, in 2014, society is still largely facing the same issues: how to ensure organisations are applying accepted standards to their websites and how to regulate compliance with these standards.

The issue of whether a website constitutes a place of business was settled in the United States in 2008 with the settlement of the case against Target.com. The Federal judge in that case ruled that Target.com did have a case to answer and that:

... whether or not they are, or are connected to, a physical place, and that those aspects of Target.com's services that are sufficiently integrated with those of physical Target Stores are covered by the ADA's non-discrimination provisions. (W3C, 2009a).

The class action case against Target.com in the United States resulted in a settlement where Target Corporation agreed to pay class damages of \$US 6 million, and the National Federation of the Blind

(NFB) was awarded reasonable attorney's fees and costs of \$US 3,738,864.96. The settlement included the provision for accessibility improvements in the website to be monitored by the NFB with a deadline for completion by February 28, 2009 (W3C, 2009b). This was termed "monitored compliance" and placed the NFB in the interesting position where it was actively monitoring improvements to the website on behalf of its user community.

2.1.2 DISABILITY ACTIVISM

Societal change in the treatment of people with disabilities has evolved markedly since the second half of the 20th century (Kimberlin, 2009). Inclusive thinking has become far more apparent in terms of physical access to buildings, sanitary facilities and expectation of service provision. Service can no longer be denied on the basis of disability. While the classic definition of "disability" is probably understood by the larger community, i.e. that a person is in a wheelchair, or that a person is blind, the classification of disability or situational impairment is actually far more diverse. Davis (Davis, 2005) uses the term "invisible disability," to describe social, physical or mental issues that individuals may experience that in some way limit their ability to perform tasks or interact with others, but is not physically recognisable as such by an outside observer. In the context of web accessibility research, issues such as colour blindness, dyslexia and cognitive impairment would not be easily recognised as visible disabilities or readily be disclosed by those affected individuals. As Davis states:

Often, it is not sufficient for "invisibly disabled" persons to reveal that they are disabled and provide information about their "special needs". Those whose disabilities are invisible may also have to convince other people that they really are disabled, not seeking some special—unfair—advantage: thus, what they must do is meet a burden of proof [emphasis in original] (Davis, 2005, p. 154).

In terms of web accessibility, it can be difficult to identify how these various, and at times invisible, disabilities have impacts on the design and usability of a website. While people may recognise that a ramp is necessary for wheelchair users to gain access to physical premises, they may not instantly recognise the problems caused by the lack of colour contrast in a website for the user who is colour blind. Such issues would seem to imply that physical disability and inclusive design are better understood than digital accessibility, as the digital requirements are less tangible. Adams and Kreps (2009) discuss the need to understand the way people with disabilities interact with ICTs. According to the authors, there are some who hold to the view that "fully engaged citizens are those who are connected," while others like Castells argue that "the rise of 'informationalism' goes hand in hand with increased inequality and social exclusion" (Castells in Adam & Kreps, 2009). Adam and Kreps also state that:

If disability receives less attention than it deserves and if disability activists are not involved in making this discourse, this suggests that this discourse struggles to engage with mechanisms which could make a material difference to web accessibility for disabled people (Adam & Kreps, 2009, p. 1045).

While Berners-Lee states that “The power of the Web is in its universality. Access by everyone regardless of disability is an essential aspect” (Henry & McGee, 2010), Adam and Kreps claim that “the greater portion of the services and interactions available on networked computers has been designed for the able-bodied” (Adam & Kreps, 2009). In the discourse on the social construction of disability, Adam and Kreps (2009, p. 1048) conclude:

In other words, the onus can be placed on a wider society to make the Internet and web accessible, rather than the onus being on the individual disabled person to acquire specific technical aids and/or to struggle with poorly designed and often inaccessible websites.

Brajnik (2008) points out that “disabled and non-disabled people often encounter the same problems, but are affected by them differently” which is also discussed in the discourses of Adam and Kreps. Takagi et al.’s view is that it was the issue of access for blind users which helped drive the initial efforts in website accessibility in the late 1990s. (Takagi et al., 2004b)

Nagano et al.’s study, *Activities for Improving Web Accessibility* (Nagano, Sugimoto, Yoshimoto, & Tsuchiya, 2009) draws attention to the fact that disability issues other than vision require consideration when developing websites. They state:

The new *WCAG 2.0* is likely to integrate consideration for persons with hearing disabilities and cognitive disabilities. In Japan, consideration for foreign residents and children is increasing its importance amid a declining birth-rate and an aging population.

Nagano et al. (2009) also drew attention to an initiative by Fujitsu to develop a Web browser, *WebUD*, which is a tool that:

... gives consideration to persons with reduced vision, persons with color blindness, persons with intellectual disabilities, persons with limb disabilities, older persons and foreign residents. This tool supports a text read-out function, enlargement/reduction of letters and figures, changes of text and background colors, display of phonetic pronunciation of Chinese letters (Kanji), input support based on software keyboard and so on. As a part of Website accessibility improvement, this tool has been introduced to each Website and end users can use the features free of charge. (Nagano et al., 2009)

Loiacono and Djambasi (2013) state that the majority of people without disabilities support the requirement for companies to provide access to web-based services for people with disabilities, and will vote in favour of laws that require website accessibility. They assert that these same people are often not in a position to judge what is and is not accessible. This requires an impetus from people with disabilities to identify issues, to push their causes forward and to pursue means of ensuring adherence to these laws, once they have been created.

In many ways, the *WCAG 2.0 guidelines*, and other accessibility initiatives of the W3C, are attempting to capture and address as many of the accessibility variants as possible in a set of guidelines represented as

minimum standards. While the guidelines themselves do not claim to address every user requirement, they and other initiatives are attempting to cover as broad a user base as possible.

2.1.3 WORLD WIDE WEB CONSORTIUM WEB ACCESSIBILITY INITIATIVE (W3C WAI)

The vision of the W3C is stated to be “One Web” which is further expanded by its mission statement: “to lead the World Wide Web to its full potential by developing protocols and guidelines that ensure long-term growth of the Web” (W3C, 2012a). This mission statement is broken down into a number of aspects.

The first is the *Open Standards Principle* which reflects an agreement signed on 29 August 2012 by five leading global organisations, agreeing to a set of principles that support “an open and collectively empowering model that will help radically improve the way people around the world develop new technologies and innovate for humanity.” (W3C, 2012a)

The second is the *Design principle* which guides the work of the W3C. The first aspect of this principle is the *Web for All* which reflects the social value of the Web and includes the *Web Accessibility Initiative* (WAI), internationalisation, and the *Mobile Web for Social Development*. The second aspect is *Web on Everything* which includes *Web of Devices*, *Mobile Web Initiative*, and *Browsers and Other Agents*.

The third and final principle is the *Vision principle* which reflects the aim of involving participation, sharing knowledge and building trust on a global scale. The *Vision principle* includes three sub-sections, the first of which is the *Web for Rich Interaction*. This aspect is intended to foster the idea of everyone being able to share information. The *Web of Data and Services* joins two thoughts, which view the Web as a repository of information and also as a set of services that exchange messages. The third idea is the *Web of Trust*, which involves the concepts of the semantic web, wireless mark-up language (WML) security and the *Web of Services Security and Privacy*. (W3C, 2012a)

The aspect of the W3C which pertains most to this thesis is that of the *Design Principle*, particularly the aspects of the *Web for All*, specifically the Web Accessibility Initiative (WAI). The *Web Content Accessibility Guidelines* (WCAG) form part of the work of the WAI.

The most recent version of WCAG, *Version 2.0* has been acknowledged as the de facto standard for website accessibility throughout most of the world. These *Guidelines* are the result of international collaboration by the members of the WAI and are rapidly being adopted, replacing *Version 1.0* which has been in place since May, 1999. WCAG *Version 2.0* was released in December 2008 and has been accepted as the new standard (W3C, 2008e). In Australia, WCAG *Version 2.0* has been officially recognised as the established standard by both the Australian Government (Australian Government Information Management Office (AGIMO), 2010b) and the Australian Human Rights Commission (Australian Human Rights Commission, 2010). In addition to the

full version of the *Guidelines*, the W3C WAI has released other documents: *How to Meet WCAG 2.0*, *Understanding WCAG 2.0* and *Techniques for WCAG 2.0* to assist in understanding, applying and testing websites against these *Guidelines* (W3C, 2008a, 2010c; World Wide Web Consortium (W3C)). The W3C WAI has built a *Test Samples Repository* (Abou-Zahra & Cooper, 2008) to “help promote a common understanding of WCAG 2.0 and the development of accurate Web accessibility evaluation tools.”

To date, the United States has relied on *Section 508 of the Rehabilitation Act* (United States Government, 2014) which incorporates many of the points of WCAG 1.0. Nagano et al. (2009) state that, along with efforts of other countries, consideration is being given to harmonizing *Section 508* with WCAG 2.0 in the future.

While most of the literature studied reflects agreement with the W3C and its development of WCAG 2.0, not all authors agree wholeheartedly on the usefulness of the document. In their paper *Disability and Discourses of Web Accessibility*, Adam and Kreps (2009) discuss the lack of disabled members of the WAI, and the WAI’s failure to understand the ways in which disabled users interact with the Internet. In particular, they discuss the fact that disability activists seem to be missing from the “standard-making agenda of the web accessibility movement.” They observe that creating standards is political in nature, and that “discourses represent political positions, developed from the interests of those who are instrumental in constructing them.” In this paper, the authors discuss the different ways of looking at disabilities, including the “digital divide discourse, social construction of disability discourse, historical relationship between disability and technology, and legal discourse” (Adam & Kreps, 2009). Their conclusion is that disability activists must be included in the standard-making agenda for web accessibility if there is to be any potential for the Web to meet the goal of becoming truly socially inclusive (Adam & Kreps, 2009).

Kelly et al. (2009) propose that, if WAI was to address a number of issues, it would provide a “more solid set of foundations on which to develop an environment for building more accessible web services” (Kelly et al., 2009). These issues include clarifying the WAI model with the inclusion of *User Agent Accessibility Guidelines (UAAG 2.0)*-compliant user agents and *Authoring Tool Accessibility Guidelines (ATAG 2.0)*-compliant authoring tools, clarifying the role of context, acknowledging that the ultimate goal is accessibility for users, acknowledging the relevance of diversity, de-emphasizing automated checking, refocusing on WAI’s education and outreach activities, and engaging with a wider range of stakeholders. Since the Kelly et al. paper was written in 2009, the WAI has addressed many of these issues. The WAI suite of resources now includes *Accessible Rich Internet Applications (WAI-ARIA)*, and *WAI-ARIA 1.0 User Agent Implementation Guide* as proposed recommendations, while the *WCAG Evaluation Methodology (WCAG-EM)* has been adopted as a W3C Working Group Note as of July 10, 2014. The *WCAG 2.0 Techniques update, Easy Checks*, a first review of web accessibility documents, and *User Agent Accessibility Guidelines (UAAG) 2.0* exist as a last call working draft. New working groups and task forces such as the *Cognitive Accessibility Task Force* and the *Mobile*

Accessibility Task Force, and notes on how to apply *WCAG 2.0* to *Non-Web ICT* (WCAG2ICT) are all under development. (W3C, 2014)

Research into the testability of *WCAG 1.0* and *WCAG 2.0* (Rømen & Svanæs, 2012) found that only 27% of accessibility violations were located by disabled testers using *WCAG 1.0*. These findings improved by only 5% to 32% with *WCAG 2.0*. The fact that this difference was marginal led the authors to state that:

... future versions of the accessibility guidelines should be based on empirical data and validated empirically and that WAI expand their definition of accessibility to include “usability for all” in accordance with ISO 9241-171:2008 (Rømen & Svanæs, 2012).

The W3C is a driver of web technologies and, in particular, through its contributing members and working groups, is putting substantial amounts of work into the accessibility space. As later sections will discuss, it is the assumption of this thesis, supported in part by the literature, that, while organisations like the W3C drive technological change, it is governments, large organisations and the wider web community's adoption of such technologies, that drive social change.

2.1.4 STUDIES OF OTHER COUNTRIES

The notion of a website being the first and primary point of access for gaining access to government services has increased dramatically over the past twenty years (Luxton, 2011). Consequently, many countries have conducted reviews of local government and national e-government websites to determine their levels of accessibility. A number of these reviews are presented here, in conjunction with studies conducted outside Australia, to facilitate a comparison with measures undertaken in Australia.

In 2009, research was conducted into the accessibility of United Kingdom e-government websites (Kuzma, 2009). In this project, 130 sites of members of parliament were assessed. The author cites a 2005 study that asserted that 97% of official sites in the U.K. government were “unusable by disabled people, largely because they ignored well-known techniques for making data accessible ... only 3% of the sites that were studied passed basic W3C accessibility guidelines” (Kuzma, 2009). Kuzma’s more recent study (Kuzma, 2009) used an automated checking tool, *Ergami*, but asserted that a manual check should be used to verify the accuracy of the automated tool and to find other issues that are not checked by such a tool. In Kuzma’s study, 23% of the sites met *WCAG 1.0* Priority Level A, but only 5% met *WCAG 2.0* Level A.

A 2012 study of local government websites in Romania involved sixty websites evaluated against *WCAG 2.0*, which was a follow-up to a review of those same websites conducted in 2010 (Pribeanu, Marinescu, Fogarassy-Neszly, & Gheorghe-Moisii, 2012). This study used an automated tool and reviewed only two pages from each website. The results indicated that no homepage in the sample was without accessibility violations. Average errors per web page were 69.1. For the second page evaluated, no page was without accessibility violations

with the average error rate being 58.81. The researchers discovered that the highest rate of errors occurred in the perceivable principle of *WCAG 2.0*. The researchers stated that most of the developers were aware of accessibility requirements and the tools available, but this factor did not relate to improved accessibility. The research did not reveal how the authors made this assertion as they did not provide evidence of surveys or other methods of obtaining this information. The researchers questioned whether a future study might show the private sector to be more advanced in the adoption of website accessibility than municipal government. Such concerns are closely related to topics explored in this thesis (Pribeanu et al., 2012).

A website accessibility evaluation of South Korean e-Government websites was completed in 2006. Although the Korean e-government portal ranked the highest in the world in 2006 and 2007, according to the Brown University study (West, 2007), it was the only country in the top 10 e-governments that complied with less than 20% of the W3C accessibility guidelines. The guidelines used in this study were *WCAG 1.0* Priority Level A, and the research used only the *Bobby* software tool to assess the sites. *Bobby* was available from Watchfire and was then purchased by IBM. It has since become part of the IBM suite of tools as a commercial product.

In 2010, a study was conducted to assess the accessibility of e-government websites in Saudi Arabia (Al-Khalifa, 2010). According to the study, Saudi Arabia is the largest ICT market in the Middle East, with its telecommunications market comprising over 51% of the Middle East market. This study included a literature review of progress towards website accessibility in other countries besides Saudi Arabia and compared the way these sites were assessed. In this study, only the home pages of the websites were assessed and *WCAG 2.0* was used as the criterion for assessment. Due to the lack of language automated assessment tools in the Arabic language, the sites were mainly assessed by a human assessment method, though code was validated against the W3C validation site, with the WAVE toolbar (WebAIM, 2012b) being used for assistance when necessary. The paper asserted that, while an automated testing suite was unavailable at that time in the Saudi language, it is necessary to use a combination of methods for adequate testing. The results of this study show:

... no single Saudi government Web site has passed the *WCAG 2.0* conformance test. The findings also show that most Saudi government homepages, regardless of the sector, suffer from various accessibility issues (Al-Khalifa, 2010).

Further findings of Al-Khalifa's research illustrate the need for a longitudinal study in order to observe any progress toward web accessibility goals. The report discussed the need for specific legislation relating to web accessibility as well as discussing the difficulties in enforcing legislation. It is interesting to note that Al-Khalifa states, "Clearly, this study will be the first to use *WCAG 2.0* to evaluate the accessibility of government Web sites." (Al-Khalifa, 2010)

In the Czech Republic, a study was completed in 2009 by Kopackova, Michalek and Cejna (2009). Thirty-nine e-government websites were assessed in March 2006 and again in April 2008. The websites were chosen at random from municipalities which had more than 1000 residents. The authors examined local government

sites, as they were assumed to be the first point of contact for citizens, as they are close to where residents live. This study used a hybrid approach, not relying solely on human or automated evaluation. However, it was limited by the use of *WCAG 1.0* and the software tool, *Bobby*, which is no longer freely available and the fact that it was only used to test the home pages of the websites. Interestingly, the study incorporated the sometimes overlooked aspect of “findability,” by using Google to find the municipality and assessing where it ranged in the search results. Some of these concepts would relate more to usability than accessibility, which is explored later in this thesis. The authors also assessed the comprehensibility of the website’s URL and its display in a low-resolution browser, among other criteria. The researchers hypothesised that the quality of web presentation would be dependent on the size of the municipality, but this was disproved. They also hypothesised that there would be a relationship between accessibility and “findability,” which was confirmed. The third hypothesis was that websites would improve over the tested periods, between 2006 and 2008, which yielded inconclusive results with only three out of nine criteria showing considerable improvement. The conclusion to this research states that the authors found “fundamental deficiencies preventing users from finding and displaying the required information ... most of these webpages were hard to access, both from the accessibility point of view and from the search engine point of view as well.” The authors recommend “a stricter approach in legislation” involving penalties for non-compliance (Kopackova et al., 2009).

In Japan, Nagano et al. (Nagano et al., 2009) states that the equivalent to *WCAG* is known as *JIS X 8341-3*. These guidelines will be revised to reflect *WCAG 2.0* standards. This paper also describes Fujitsu’s product, the *WebUD* browser.

After earlier research (Green & Huprich, 2009; Walling, 2004) indicated that there were insufficient disability and related courses in curricula in schools of Library and Information Science (SLIS) in the United States, a 2009 study examined the websites of the top twelve SLIS. This study included the level of preparation received by students in the area of disability services and accessibility. The websites were examined for compliance with *Section 508* using the online version of the automated *WebXACT* tool, which is no longer available. Finally, a survey was given to all full-time SLIS students at each of these twelve schools. The results show that two of the twelve schools had no automated *Section 508* errors, with the most common errors reported being lack of alternative text for images and lack of labels properly associated with form controls. The survey results indicate that the two schools with no accessibility violations in the testing were the ones reported in the surveys as being most consistent in checking accessibility compliance. Additionally these two schools report strong support for accessibility courses with disability-related issues included in their core units. (Green & Huprich, 2009)

In an effort to understand whether the size and the national culture and/or legislation affect the accessibility of websites, a study was conducted in 2012 of companies included in the EURO STOXX600 (The STOXX Europe 600 Index, cited by (Lorca, Andr ees, & Mart inez, 2012)). The results demonstrated that larger firms and Anglo-

Saxon firms were more likely to have more accessible websites. The authors hypothesise that this may be due to the understanding of larger firms of the idea of corporate social responsibility (CSR) and of having a strategy to meet those goals. They state that the CSR strategies are shaped by national factors such as legislation and that “CSR is part of the expected repertoire of every company wanting to be perceived as modern and legitimate” (Lorca et al., 2012, p. 393). The concept of CSR being a driving force in adoption of website accessibility principles is further explored in the study by Martínez et al., reviewed later in this chapter. In this instance, European banks more heavily invested in CSR were less likely to have accessible websites. (Martínez, De Andrés, & García, 2014)

Another international study was conducted by Williams and Rattray (2005) which assessed the home pages of 100 U.S. and 100 U.K. hotel websites, using the *Bobby* automated tool, and checking against *WCAG 1.0*. Even with these limitations on the research, only thirteen percent of the U.K., and six percent of the U.S websites, passed the Priority 1 checkpoints that *Bobby* was able to assess. The researchers expressed surprise that such an overwhelming majority of the websites did not pass the most basic level, but also that more U.K. websites passed the accessibility test than U.S websites:

One might have expected that the US as a more litigious society and as an earlier adopter of the technology might have provided greater accessibility. Some further research might be needed here, however. It may be the case that the US sites are more prone to fail the accessibility standards by virtue of the fact that they exhibit more advanced design. This does not mitigate the fact though that the vast majority of sites are failing to meet the competitive, developing legal, social-moral and technological imperatives for accessibility. (Williams & Rattray, 2005, p. 84)

A study comparing website accessibility in South Korea with that of the United States (Hong, Katerattanakkul, & Lee, 2008) examined methods of assessing websites. However the study used the *WCAG Version 1.0* guidelines and the automated tool *Bobby*. The criteria for assessing the websites were limited to a few categories, but the study did suggest the importance of a longitudinal study to observe changes over time. This research also considered the cultural differences in website design between countries. In addition, this research discussed the need to assess a website’s accessibility with a variety of methods, including both automated tools and evaluation by human experts.

The research by Hong et al. (Hong et al., 2008) compared e-government websites in Korea and the United States and drew some interesting conclusions. While the Korean websites contained approximately twice as many accessibility errors as the United States websites, they also contained twice as many non-textual images. The authors make some interesting, yet unsubstantiated, claims regarding the cultural differences in website design in the two countries. They drew the conclusion that these differences could be applied more broadly: “the differences are not only in website design, Korean cloth, house, food etc., are much more fancy and splendid than those of the USA” (Hong et al., 2008). This comment-reflects a distinct bias in the research. The case study also analysed only eight websites, four from each government, and four from similar sectors. In

addition, the research assessed the websites against only six criteria: images, tables, frames, navigation, applet/scripts, and flicker rates.

Darrell West of Brown University in Rhode Island has been presenting an update on global e-government for seven years. In these studies, he assesses the performance of 1687 government websites in 198 countries. His most recent report, released in 2007, demonstrates that “23 percent of government websites have some form of disability access, meaning access for persons with disabilities, the same as last year”(West, 2007). Again, *WCAG 1.0* and *Bobby* were used for the analysis. The fact that only 23% of the websites passed *WCAG 1.0* Priority Level 1, and that this did not change from 2006 to 2007, is of great concern. West found that Australia ranked in the top 10 countries for the e-government ratings, coming in eighth place in 2007, improving from twelfth in 2006. Australia ranked more highly in the accessibility features, scoring better than Great Britain and the United States.

2.1.5 CORPORATE WEBSITE ACCESSIBILITY

While the principal purpose of this research is to observe e-government website accessibility compliance in Australia in the context of the *NTS*, a number of non-government websites form part of the case study. These websites include government-affiliated, not-for-profit, and corporate entities. These websites have been included in order to facilitate a more thorough look at website accessibility in Australia, and also because they are also covered by the *DDA*, which is administered by the (Australian Human Rights Commission).

The section on litigation below describes how litigation may affect website accessibility issues. A study entitled *The State of Corporate Website Accessibility* (Loiacono, Romano, & McCoy, 2009), draws attention to the fact that in the United States the sector with a disability comprises 19.3% of the population, making it the largest minority group in the country. According to Loiacono (Loiacono, 2004; United States National Telecommunications and Information Administration, 2011), an earlier estimate was that fifty percent of working-age adults with disabilities shop online. It is expected that this figure has increased considerably since the time of Loiacono et al.’s research. The market share controlled by people with disabilities is twice that of teenagers and seventeen times that of the “tweens” (8-12 year olds), the most sought-after demographic groups in the United States. Emphasis in the paper is placed on the fact that the buying power of people with a disability is largely untapped, but is growing quickly. This research cites an earlier analysis of the Fortune 100 company websites which revealed that “over 80% of the F100’s websites were potentially inaccessible to people with visual disabilities” (Loiacono, McCoy, & Chin, 2005). While this study used only the top level home pages, the *Bobby* assessment tool, and *WCAG 1.0*, it produced some important results. There had been some improvement over the initial study, with the number of websites meeting *WCAG 1.0* Level 1 increasing by one-third; however, the number of websites meeting Priority 2 or 3 had dropped from five to one. The proportion of websites passing the user checks in this study was only 30%. The authors determined that:

These results suggest that companies may use Web site validation tools and correct obvious errors; however they may have expended less effort to examine manual checkpoints. ... giving sites little more than “face-accessibility” or a sense of “virtual compliance” to the guidelines (Loiacono et al., 2005).

A thesis by Law (2010) examined issues regarding website accessibility in Australia from a corporate perspective. While this research did not involve auditing of websites, it did examine issues beyond those of technical accessibility compliance. The Law study involved interviewing ten businesses in Australia to determine corporate attitudes. This study also produced a list of seven success factors considered critical for the accessibility of Australian corporate websites. The success factors identified ranged from issues relating to how disability is viewed, ensuring there is a corporate attitude that supports and plans for equality of access, and ensuring responsibility is shared in properly resourcing website accessibility functions. While Law stated that these success factors related to corporate websites, previously cited literature indicated they would also relate to government, not-for-profit and private websites.

A study which included companies in the EURO STOXX 600 and also considered CSR strategies, similar to the study by Lorca et al., examined the websites of forty-nine European banks. Martínez, De Andrés, and García (2014) hypothesised that website accessibility may be motivated by operational factors such as reductions in the cost of information systems, and potential increases in revenue, as these factors may enhance operational efficiency. Secondly, it was hypothesised that large banks would have more accessible websites due to their greater financial resources, as smaller firms might lack the information technology resources and overall awareness of the issue of website accessibility. Lastly, it was hypothesised that banks more committed to a CSR strategy would be more likely to implement website accessibility measures. The overall findings indicate that neither organisation size nor operational factors significantly influenced the levels of website accessibility. Moreover, organisations with a stronger commitment to CSR had less-accessible websites. The authors suggest that banks may have tried to overcome their lack of CSR strategy by engaging in other activities, such as website accessibility (Martínez et al., 2014)

Hotel websites were the subject of a study completed by Williams and Rattray (2005). The study analysed 85 U.K. and 88 U.S. hotel websites, using a search string to choose hotels from the seven largest cities of each country. This study is somewhat dated due to the use of the Bobby automated tool and *WCAG 1.0*. However, it does raise some interesting points. Firstly, the research highlights the issue of reliance upon automated tools, as manual confirmation of results was found to be necessary. Secondly, the study results indicate a very low level of accessibility compliance, as only thirteen percent of the U.K. and six percent of the U.S. sites passed *WCAG 1.0 Priority 1*. The researchers concluded that organisations were either unaware of the significance of website accessibility compliance or chose to ignore it. Williams and Rattray highlighted the business benefits of incorporating website accessibility as well as the risks of ignoring the issue. Because of competitive, legal, moral and technological reasons, the researchers stated that website accessibility is already

an important issue for organisations if they wish to communicate effectively, and will only increase in significance as population demographics change.

While many people in the accessibility community assume that it will be the fear of litigation that pushes the corporate world to embrace website accessibility, there are some who say that CSR may provide the impetus as a means of demonstrating the organisation's commitment to the needs of its users. For example, Williams and Rattray argue:

Where the law does not apply organisations are increasingly being held to account by what is perceived to be their corporate social responsibility. As accessibility involves access to information organisations will increasingly find themselves held to account here (Williams & Rattray, 2005, p. 86).

Falck and Heblich (Falck & Heblich, 2007) define CSR as "... voluntary corporate commitment to exceed the explicit and implicit obligations imposed on a company by society's expectations of conventional corporate behaviour."

CSR may also be driven by the company's desire to be observed doing the right thing by its users and shareholders. Loiacono and Djambasi (2013) state that the majority of people without disabilities believe companies should provide access to IT for people with disabilities regardless of the cost and that these customers would be prepared to boycott companies which do not provide this service.

Using the concept of sustainability reporting, Adams and Frost (Adams & Frost, 2006) express the idea that the need to engage with a wide range of stakeholders, in a more effective manner, will result in that information being distributed more accessibly. The researchers state that due to the increasing awareness of CSR, there has been a growing demand for "accountability with respect to social and environmental impacts" (Adams & Frost, 2006, p. 276). They see this recent acknowledgement of the corporate website being the primary means of disseminating sustainability information as a factor in the adoption of website accessibility and functionality requirements. Adams and Frost conducted interviews and monitored the website usage of twenty-four companies in Australia, Germany and the United Kingdom to determine how the companies disseminated information on sustainability. How accessible that information was for users was determined through the use of user surveys.

Ismail et al. (Adelopo, Moure, Preciado, & Musa, 2012) contribute to the argument for the need for accessibility as it relates to CSR requirements. However their study, while discussing accessibility of information on the website, is more related to the ease of locating the CSR information in proximity to the home page. According to these researchers, the "number of clicks remains a key measure of access to the required information on a website" (Adelopo et al., 2012), thereby neglecting the issue of access by persons

with disability. They do affirm that the whole purpose of communication is lost if the intended recipients are unable to access the information.

De Andrés, Lorca and Martínez (2010) researched the accessibility of the websites of 108 non-financial firms from France, Germany Spain and the United States in order to identify the factors that influenced the implementation of web accessibility. They argue that there is a difference between web accessibility and other technological innovations involving information systems. Web accessibility “has a societal aspect and can be considered an aspect of the corporate social responsibility (CSR) strategy of the firm.” (De Andrés et al., 2010, p. 77). De Andrés et al. state that, while there can be considerable costs in implementing a web accessibility program, the costs are often offset by a full return on investment, a concept further expanded by W3C WAI (W3C, 2013a).

A number of factors which influence an organisation’s decision to implement a web accessibility programme were identified by De Andrés et al. The first is a group of operational factors, in which website accessibility may increase a firm’s performance, reducing the cost of information systems due to decreased site maintenance time and personnel, reduced server load and allowing for content re-use by using metadata and representing it in a resource description framework (Henry, 2005, cited in (De Andrés et al., 2010). The second point is that improvements in web accessibility may help to increase revenue by making it easier for users to find a web site, and use it successfully, resulting in more people using the website effectively. This larger audience may in turn increase the potential for the website to be used by even more people and make the website more findable by people with and without disabilities. De Andrés et al. propose two hypotheses: that “firms implement web accessibility in order to increase their operational performance” and “firms implement web accessibility in order to reduce their capital costs.” The researchers state:

Web accessibility can create strategic benefits for a firm even when they are not readily measurable, such as increases in operational performance or reductions in capital costs. This is because web accessibility can be considered a CSR initiative (De Andrés et al., 2010, p. 80).

The final results from the De Andrés et al. study (De Andrés et al., 2010) indicate that the reasons for implementing web accessibility were operational rather than social or financial, aimed at increasing efficiency of operations. They found that these operational factors were not relevant when differentiating between the most accessible and least accessible websites. Rather they demonstrated the same trend identified in the study of the websites of European banks (Martínez et al., 2014), which observed that the less committed the organisation was to CSR, the more committed the company was to ensuring their website was accessible. The researchers concluded that governments should help organisations to understand that website accessibility should be an integral part of their CSR strategies. (De Andrés et al., 2010)

Peters and Bradbard (2007) state that in 2005 there were approximately 40 million Americans with at least one form of disability and more recent estimates (2007) put this figure as high as 50 million. Moreover, it was expected that this figure would double by 2030 (Zwillich, 2007 cited in Peters & Bradbard, 2007). In the United States, as in Australia, the number of people with disabilities who have access to the Internet from home is growing rapidly. Peters and Bradbard state that online consumers with disabilities are spending amounts equal to people without disabilities. In many cases, it is easier for a person with disabilities to shop or conduct business online than it is in person. The researchers point to a number of assistive technologies designed to allow consumers with disabilities to search the Web more easily, but report that this is little help if websites are not designed for accessibility.

Although some opponents of the push for website accessibility argue that it is not possible to have an accessible website without sacrificing the attractive media-rich elements, Peters and Bradbard (2007) describe the study by Hackett, Parmanto and Zeng (2005) which states that this is not the case. The government websites reviewed were just as rich in content, graphics and communication as the non-government websites, yet remained more accessible over time. Peters and Bradbard argue that their study provides evidence that designing for accessibility does not “limit the ability to design a communication-rich website” (Peters & Bradbard, 2007). This is also illustrated by the *Before and After Demonstration (BAD)* provided by W3C WAI (W3C, 2012b).

Peters and Bradbard (2007) comment upon the different industries which do not have adequately accessible websites to meet the needs of users, mentioning clothing, hotels and grocery stores. It should be noted that this study was completed in 2007. Since that time there has been an obvious increase in the number of retailers providing online shopping platforms, including grocery stores which do not yet appear in accessibility research literature. In Australia, according to the *NAB Online Retail Sales Index: In depth & special report* (National Australia Bank, 2014), the year up to January 2014 demonstrates growth in online sales of 11.3%, which represents approximately 6.5% of traditional retail spending. Seeney, from the Small Business Development Corporation in Western Australia, quotes from *IBISWorld (IBISWorld, 2014)*:

Hence the domestic segment is not only growing faster but also accounts for the majority of Australian online retailing. This information does not offer the number of new entries into the market place but it stands to reason that a proportion of industry growth would be generated from new start-ups (IBISWorld cited in Seeney, 2014).

Loiacono and Djambasi (2013) discovered that a company was more likely to conduct website accessibility testing if they already conducted usability testing. They noted that it made sense to increase usability testing so that accessibility testing also increased. They believed this would be driven by the economic incentive demonstrated by an 83% return on IT investment being gained by conducting usability testing.

The issue of how organisations make compliance claims for the accessibility of their websites is the subject of research by Brown and Conway (2012). The authors were judges in an Australian web awards event. Nominees were requested to provide a statement about the accessibility of their websites, for example whether they met WCAG 2.0 A or AA. The websites were also audited to check for agreement between the nominee-claimed compliance and audit results. Finalists were surveyed about their awareness of the accessibility guidelines and tools and methodologies. Very few of the award nominees met their stated compliance levels and, from the survey results, Brown and Conway concluded that website developers and designers were largely unaware of accessibility requirements or evaluation methods.

2.1.6 GOVERNMENT AS DRIVERS FOR CHANGE

In *Equality and Legitimacy*, Sadurski (2008) states that a legitimate government must “treat all citizens not just with a measure of concern but with equal concern” and that “its laws must also comply with certain values, such as human dignity, liberty etc., in order to be fully legitimate.” Roy discusses the capacity of governments to “effectively harness new information technology as an enabling force in ... efforts to meet the present and emerging challenges of a digital age” (Roy, 2001). Roy concludes his discussion on the difficulties of e-government to change its delivery model to provide information to its citizens effectively:

In this sense, digital government must reposition itself to become an engaged and constructive partner in shaping the new governance patterns that will otherwise render it rudderless. These governance patterns must bridge traditional administrative and political-cultural frameworks to the adaptive and collaborative requirements of e-governance to produce a *new culture in government*, one open and enabled to take advantage of the enormous potential of the digital and information age (emphasis in original) (Roy, 2001) .

McCrudden (2009) advances the concept that governments can legitimately buy social change by using “their contracting power in order to advance social equality and reduce discrimination ...” In effect, that is what has happened in the United States with the promulgation of *Section 508 of the Rehabilitation Act* (United States Government, 2014) which is closely tied to government procurement of products and services.

While it would seem logical that governments should drive the adoption of website accessibility principles, a study undertaken at the Brookings Institute (West, 2008) demonstrates that, at the date of the study, governments were largely not ensuring that their websites were accessible. Of 1,667 websites from 198 nations around the world, assessed in 2008, an increased number of websites offered fully executable services online. 50% of sites were compliant, a significant increase from the previous year’s total of 28%. However, only sixteen percent of the websites assessed have “some form of access for disabled persons”(West, 2008).

Pribeanu et al. (Pribeanu et al., 2012) points out that the drive in Europe towards greater website accessibility followed a commitment from the Riga Ministerial Declaration in 2006 (Pribeanu et al., 2012; Riga Ministerial

Declaration, 2006). Following this declaration, several initiatives and documents were published supporting the European Commission's "European i2010 initiative on e-Inclusion"(COM 694: European i2010 initiative on e-Inclusion., 2007).

The Government of Canada has taken a similar approach, requiring that all new web-related products "incorporate Web accessibility into the business requirements when developing, updating or procuring Web applications, systems, software or technologies" (Treasury Board of Canada Secretariat, 2013)

West clearly states that e-government has not been successful in "radically transforming the public sector". After describing how the United States is falling behind in the provision of broadband access. West states:

This limits the transformational potential of the Internet and weakens the ability of technology to empower citizens and businesses. Government websites must make better use of available technology, and address problems of access and democratic outreach (West, 2008).

Looking at disability access to these websites, measured by compliance with *W3C Guidelines* using the WAVE tool from WebAIM (WebAIM, 2012b), West asserts that little progress has been made between 2004, when 14% were compliant, and 2008 with 16% compliance.

A study conducted by Hackett, Parmanto, and Zeng (2005) compared a random sample of general websites with a sample of U.S. government websites over a five-year period from 1997 to 2002. This study found that while both groups increased in complexity, adding increasingly rich content and graphics, the general websites became more inaccessible as they increased in complexity compared to the U.S. government websites which remained relatively accessible. The researchers attribute this to the enforceability of *Section 508 of the Rehabilitation Act* which makes it illegal to fail to provide access to both electronic and information technology to persons with disabilities.

From available literature, there would appear to be a drive by governments to put website accessibility high on the agenda. It is hoped that if government bodies are leading the way, the corporate world will take notice. For many governments, it is their desire to fulfil commitments under the United Nations *Convention on the Rights of Persons with Disabilities* (United Nations Web Services Section, 2006) that is driving change within individual countries.

Further investigation into Australian Government efforts to ensure website accessibility are provided in the next section on the Australian context, and in the discussion of the Australian Government's *National Transition Strategy*, ahead in 2.1.13.

2.1.7 AUSTRALIAN CONTEXT

The Australian Government, in an effort to work towards democratizing access to web-related resources, is endeavouring to lead the way by requiring for government that “...all web resources be accessible to the widest range of people including those with disabilities, older Australians and users facing technical constraints.” This was stated to be the driver for the *NTS* (van Teulingen, 2013).

In Australia, the federal government has produced a number of guidance documents, one of which outlines procedures for specifying accessibility with web-related ICT procurement (Australian Government, 2013e). This document states that agencies bound by the *NTS* should ensure that procurement processes relating to websites and web-based services should conform to *WCAG 2.0* to Level AA.

Research into the accessibility of public library websites within Western Australia (Conway, 2010) ascertained that in 2010 none of the websites with links to online catalogues met *WCAG 2.0* Level A. These library websites are all subsidiaries to local government websites and come under the *NTS* and the Australian Human Rights Commission’s *Advisory Notes*. The Conway study also verified the agencies’ lack of understanding of website accessibility guidelines, of the benefits of conformance, and of the necessity to comply with the guidelines.

Grantham, Grantham and Powers (2012) examined forty Australian websites, including both government and non-government websites. The websites chosen included the top 20 Australian private websites from the Thomson Financials’ world scope database. Thomson Financials ranks 1800 publicly-traded Australian companies according to sales, profit, assets and market value, with points being allocated to each company’s rank within each category. The study also considered twenty Australian federal government portfolios. This research did not assess the websites according to all the *WCAG 2.0* criteria, being restricted to twelve of the criteria: W3C markup validation, images without alternative text, minimum colour contrast, text size increase, Flash/PDF that cannot be read with JAWS 4.5, use of breadcrumbs, time dependent menus, URL error detection, page titles, use of PDF/Flash forms, form sample answers missing, form validation and bypass. If a website failed one of the twelve criteria, it was considered to have failed that level of *WCAG 2.0*. There is some question about the validity of some of these checks and whether they were legitimate *WCAG 2.0* violations. For instance, the authors stated that a website would fail if the website was found “to have any errors after being passed through the W3C validator (Grantham et al., 2012). The findings from Grantham et al.’s research suggest that none of the forty websites examined met all of the criteria selected. Even if all the *WCAG 2.0* criteria had been employed, the result would have been the same, in that none of the websites passed.

Grantham et al. (2012) stated that the trend was for federal government websites to be more accessible than non-government websites and attributed this to the “Federal Government’s unwillingness to use ‘contact us’ forms and technically challenging designs”. The selection of websites evaluated in this research project included websites with complicated structures and multimedia. This researcher does not believe that this generalisation by Grantham et al. is accurate. However, their statement that, due to the changing nature of websites, “it will be near impossible to make a completely accessible website” is a valid one. This statement reflects the comments in *WCAG 2.0* which points out that it is possible for a website which passes all of the *WCAG 2.0* success criteria still to be inaccessible for some people. (W3C, 2008d)

A study was conducted by Wood et al. in 2010, which assessed the websites of the three major political parties in Australia. The study identified “several Level A and Level AA conformance issues including accessibility problems that would preclude a large number of users with disabilities, yet are relatively easy to address” (Wood, Morris, & Candler, 2013). As a result of the study, the authors then redesigned the *Dignity for Disability* website and tested it before and after the re-design to determine the effect of the accessibility corrections. The corrected website was tested to *WCAG 2.0* to Level AA, the aim being to providing a “practical approach to redesigning websites to meet W3C *WCAG 2.0* requirements”. (Wood et al., 2013). The researchers state there is a “mismatch between Australia’s commitment to accessibility and the reality” (Wood, Morris, & Candler, 2013).

In a discussion paper (van Teulingen, 2013) provided in its entirety in Appendix 4-25, the drive behind the *NTS* is related to the need to keep up with the development of the Australian Government’s web presence, ensuring that it meets accessibility standards:

Since then, the Australian Government’s web environment has significantly changed in size, complexity and in the number of online services it offers. While accessibility has been a priority for a number of years, the rapid changes in the government web environment had not kept pace with accessibility standards and required a renewed focus. It became clear that *WCAG 1.0* could no longer address innovations on Australian Government websites (van Teulingen, 2013).

2.1.8 POLICY AS A DRIVER FOR WEB ACCESSIBILITY

As demonstrated in the literature discussed, although some countries have adopted policies to drive the implementation of accessibility practices in web-related products, this does not yet appear to be widespread. While the *NTS* specifically relates to government websites, they and other Australian websites come under the jurisdiction of the *DDA* which is administered by the Australian Human Rights Commission. (Australian Human Rights Commission, 2010; W3C). The driver for implementation of *WCAG 2.0* in websites in Australia has largely been Australia’s signing and ratifying of the *UN Convention on the Rights of Persons with Disabilities* which, according to the AHRC:

... asserts the right of people with a disability to participate fully and independently in all aspects of society, including the internet and access to information. The Convention calls on parties to take all necessary measures to ensure that these rights are upheld and promoted. Australia has ratified the Convention, and so has obligations to implement policies and practices that are consistent with it (Australian Human Rights Commission, 2010).

The United Kingdom has also signed and ratified the UN *Convention on the Rights of Persons with Disabilities*, and has developed a *Web Accessibility Code of Practice* known as *BS8878* (British Standard, 2010) Hassell (2014), the lead author of *BS 8878* states it is more of a “process-oriented standard” enabling organisations to adopt best practice and understand the requirements. *BS 8878* includes aspects such as procurement, outsourcing production to third-parties, project management, assessment of accessibility risks and impacts on budgets as well as the governance of inclusion. The U.K. has also its own *Disability Discrimination Act* adopted in 1995. (Loiacono & Djasmasbi, 2013)

In the United States, the *Americans with Disabilities Act (ADA)* has been amended according to the *ADA Restoration Act* of 2008 (United States Government, 2008), clarifying previously ambiguous language regarding technological accessibility. These amendments have now passed through both houses of the U.S. Congress. The Department of Justice, in its case against Louisiana Tech, has ruled that the new *ADA Restoration Act* applies to web sites. This new *Act* will also apply eventually to state government websites. In the Settlement Agreement, among other conditions, Louisiana Tech agreed to website accessibility compliance, and to provide training for university staff ("Settlement Agreement between the United States of America, Louisiana Tech University, and the Board of Supervisors for the University of Louisiana System under the Americans with Disabilities Act," 2013)

Other countries have adopted policies or legislation to enhance website accessibility for people with disabilities. Italy adopted the *Legge Stanca* in 2004, and Germany passed the *Social Book IX* and *Behindertengleichstellungsgesetz — Equal Opportunities for Disabled People Act*, in 2002. In Europe, the Council of the European Union passed the *Accessibility of Public Websites—Accessibility for People with Disabilities Act* in 2002. In Asia, Hong Kong has the *2001 Digital 21 Strategy*, and in the People’s Republic of China, there is the *Disabled Persons Law Articles of 1990*. (Loiacono & Djasmasbi, 2013; W3C, 2006)

While the legislation in most countries appears to relate primarily to e-government, Loiacono and Djambasi (2013) conducted a survey of the factors which might have an impact on a corporate organisation’s decision to undertake website accessibility improvement programmes. They found that the key factors were the number of IT professionals employed, the level of accessibility testing performed and whether the company was in a jurisdiction which had a legislative requirement for meeting website accessibility standards. The researchers stated that statistically they found a stronger link between legislation and accessibility testing than between usability testing and accessibility testing.

Legislation affects accessibility levels in two ways: indirectly through increasing the quantity of accessibility tested websites, and directly through requiring that accessibility standards be met (Loiacono & Djasmasbi, 2013, p. 120).

2.1.9 LEGAL PRECEDENTS

As laws in various jurisdictions incorporate website accessibility requirements to counter disability discrimination, such as in Canada, the United States, Australia, the United Kingdom, New Zealand and many European countries, this researcher expects that litigation is likely to increase. Organisations which have been reluctant in the past to embrace the ideals of inclusivity in their website development will be forced to reconsider.

The studies highlighted in Section 2.1.4 show that most countries are adopting procedures, if not laws, to ensure that website accessibility is addressed. It would appear, from the literature cited previously, that e-government has already embraced the ideals of website accessibility, but that the corporate world is slow to change. In the study of U.K. and U.S. hotel websites, Williams and Rattray stated:

... if the experiences of public accommodation in physical spaces are anything to go on, organisations are likely to see the law and its interpretation catch up with the development of internet-based technologies and their application (Williams & Rattray, 2005, p. 86).

In *Disability and Discourses of Web Accessibility*, Adams and Kreps stated that, at the time of writing, the Australian *DDA* was the only web accessibility legislation that had been fully tested in court. Since 2009, when that paper was written, further successful litigation has taken place. In the Jodhan case, the applicant was successful against the Government of Canada. The applicant is legally blind and, despite being a knowledgeable computer user, was unable to access government information and services online and complained of systemic discrimination. This case is likely to cause serious repercussions internationally as the Government of Canada has been given a finite timeline to ensure that all of its websites conform to accessibility guidelines (Federal Court of Canada, 2010). Commercial litigation has increased in the last few years, with precedent-setting awards being given to applicants who are unable to access the online presence of retailers and corporate entities. The landmark case of Target.com has set a remarkable precedent for retailers and other corporations. The National Federation for the Blind (NFB) and Target settled for \$US 6 million with the NFB being awarded an additional amount of more than 3.7 million dollars for costs. The Target Corporation has agreed to its website accessibility upgrades being monitored by the National Federation for the Blind. Since the settlement, Target has been awarded “Gold Level Nonvisual Accessibility Web Certification” by the NFB.

The Infographic appearing as Figure 2-2 lists the litigation in the United States and Canada, as described by deque (deque, 2014).

In the United States, the *Americans with Disabilities Act (ADA)* (United States Department of Justice: Civil Rights Division, 2014) applies to federally-funded institutions and requires organisations with public facilities to make reasonable accommodations for those with disabilities. This is enhanced by *Section 508 of the Rehabilitation Act* (United States Government, 2014) which also applies to federally-funded institutions, including universities, requiring them to provide accessible websites. *Section 508* is currently being aligned with *WCAG 2.0*. (Bradbard & Peters, 2010)

In the United States, the case of National Federation of the Blind v. H&R Block has recently been settled, resulting in H&R Block agreeing to make their online tax and mobile applications accessible. (National Federation of the Blind, 2014) On November 25, 2013, the Department of Justice (DOJ) filed a motion to intervene in this private law suit. The DOJ stated the website “prevents some people with disabilities from completing even the most basic activities on the site.” In this motion to intervene, the DOJ requested that H&R Block be fined because the website may not be used with screen-readers, Braille displays, captioning or keyboard navigation. (National Federation of the Blind, 2014; United States District Court for the District of Massachusetts, 2013) The DOJ requested to intervene because the litigation had “significant protectable interest in enforcing the *Americans with Disabilities Act*” (United States District Court for the District of Massachusetts, 2013).

The most recent law in the U.S. is the *21st Century Video and Communication Accessibility Act of 2010 (CVAA)* which should come into effect in 2016 and will allow for fines of up to \$100,000 per day to an inaccessible mobile or communications technology (United States Government, 2010).

In Australia, an international precedent was set in 2000 when a complaint was made by Bruce Lindsay Maguire against the Sydney Organising Committee for the Olympic Games (SOCOG). In this case, the plaintiff, who had been blind since birth and used a refreshable Braille display to access the Web, lodged a complaint with the Equal Opportunities Commission (HREOC) that the SOCOG website was not accessible, as required by the *DDA*. The complaint was upheld even though SOCOG was claiming unjustifiable hardship, which also was denied by HREOC, and the plaintiff was awarded \$20,000 AUD. (Carter, 2000; World Wide Web Consortium, 2009). The Inquiry Commissioner, William Carter, QC stated:

The case for the complainant is that he has been discriminated against in the provision of services offered to the public by the respondent via its website because the respondent has treated him and proposes to treat him less favourably, in circumstances which are the same or are not materially different, than it has treated or proposes to treat a sighted person. This less favourable treatment was and is because of the fact that he is blind. ... At the time of the making of the

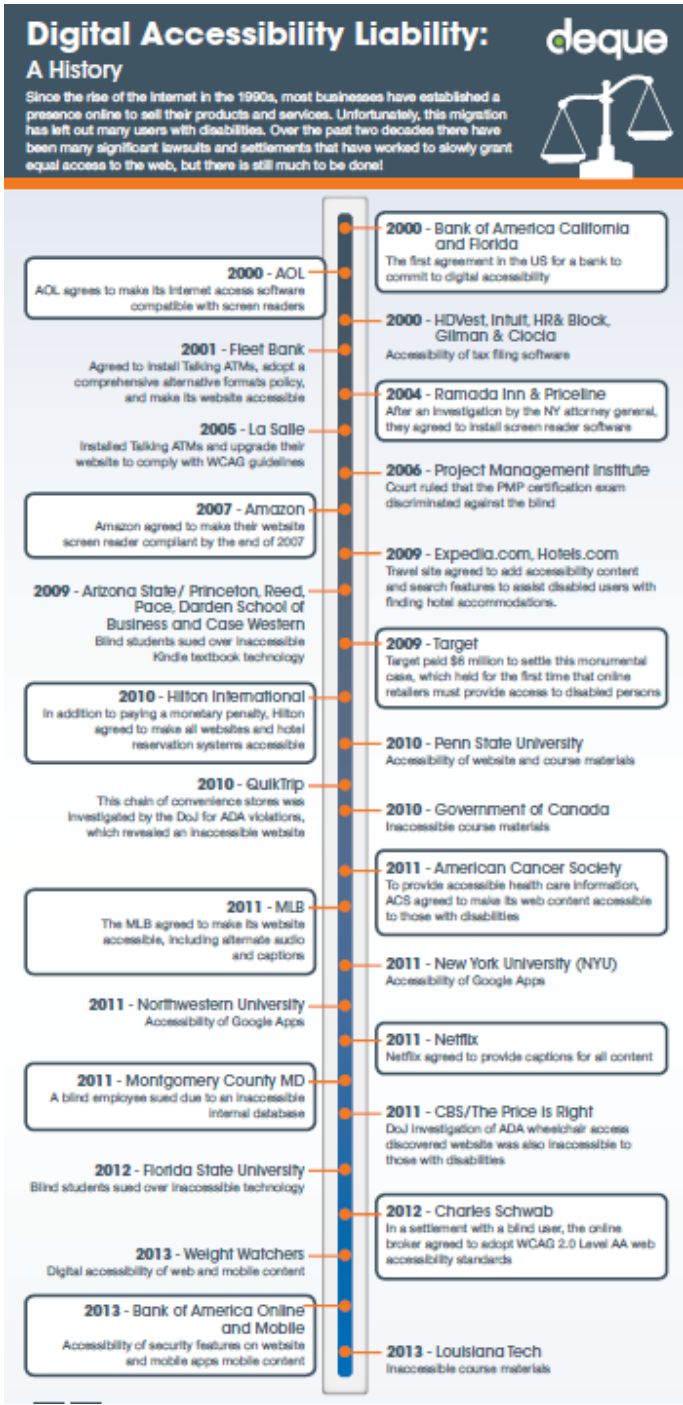


Figure 2-2: Litigation History Infographic: retrieved from deque <http://accessibility.deque.com/deque-digital-accessibility-liability-infographic>

complaint ... the complainant was clearly the recipient of less favourable treatment by the respondent in that he was unable to access the services offered by the respondent by means of its website or at best he was offered imperfect or limited access only because of the manner in which the services were made available and this less favourable treatment was because of his disability (Carter, 2000 Section 3.1 Findings: Discrimination).

2.1.10 WEBSITE EVALUATION METHODS

Brajnik (2008) discusses some of the problems in assessing accessibility conformance with guidelines in his paper focusing on evaluation methods. He makes the important observation that “even conformant websites may fail in being accessible” (Brajnik, 2008, p. 63). The paper also reminds readers that, when assessing a website against guidelines such as *WCAG*, it is necessary for both the browser and the assistive technology employed by the end-user to be conformant, something which web developers are not able to guarantee. Brajnik asserts that it is necessary to use a sampling of web pages, and that current tools were not able to test any but the simplest of websites in their entirety. His findings need to be reviewed with an analysis of newer testing tools that have been developed and refined since the release of *WCAG Version 2.0*, to determine whether with high-powered computer equipment and possibly cloud resources, entire websites might be assessed. Brajnik (2008) points out that any evaluation should address accessibility problems “whose solution makes a difference in accessibility as viewed by stakeholders.” Brajnik describes the different methods of assessing websites which included: conformance reviews, automated tests, screening techniques, barrier walkthroughs, and user testing. However, as his research was carried out in 2008, it was confined to *WCAG 1.0* which was written in a different manner, and did not devote attention to the testability of the statements provided by *WCAG 2.0*.

Evaluation typically involves taking a sample of web pages, due to the time and expense that would be incurred by attempting to assess every page of a website. In the researcher’s experience, analysis of a web page according to *WCAG 2.0* takes from one to two hours, depending upon its complexity. This also depends upon the experience and expertise of the evaluator. Brajnik, Mulas and Pitton (2007) examined the issues associated with selecting appropriate pages. The different methods available included *ad hoc* selection, where pre-defined criteria are used to choose the pages, random walk, uniform random sampling and the use of error profiles. These researchers used thirteen sampling methods on 32,000 web pages to address issues such as how to define the quality of the selection process, which processes are most effective, how to measure the quality of the methods, and which factors affect the quality of the selection. The analysis used *WCAG 1.0* as the criterion for evaluation, although it was not designed to be as testable as *WCAG 2.0*, Brajnik et al. (2007) found that the structure of the websites did not affect the sampling method chosen, that sample size affected the accuracy of the assessments and that, in some cases, a minimal sample size may result in a high accuracy

level. They found that the size of the sample, the metric used to assess the results and the sample method should be chosen with care as they are tightly interlinked. Brajnik et al. (2007) also determined that the quality of the sampling method may be defined in “terms of inaccuracy with respect to the values obtained by applying the metric on a much larger pool of pages”.

Research by Hackett and Parmanto (2009) considered whether assessing a website’s home page was sufficient to make a determination about its overall accessibility. Their research detailed numerous studies that have been conducted by examining only the home page, but concluded that using only the home page is not sufficient to determine the accessibility of a website. The authors used the *Web Accessibility Barrier (WAB)* score to determine accessibility of each page of a website. They compared the *WAB* of the home page to the *WAB* of the entire website, using this analysis on what the researchers determined to be the first 33 most popular websites. The researchers determined that these web sites were “representative of present day popular web sites.” The findings indicate that the two scores were not strongly correlated; the hypothesis that the home page is representative of the whole website in terms of accessibility being rejected. However, Hackett et al. determined that, by examining the home page and the first level of the website, a more accurate result can be obtained, as levels are highly correlated with level one. This research is further validated by Pribeanu et al. who assessed sixty websites in Romania. (Pribeanu et al., 2012). The researchers discovered that assessing the home page plus one other from each website using an automated tool did not reflect the overall accessibility of the website.

Additional research points out the need for a hybrid approach to performing accessibility audits of websites. The *NTS* also affirms the need to use human evaluation in addition to at least two or more automated tools (Australian Government Information Management Office (AGIMO), 2010b). In research that compares the Korean and United States e-government websites, and the use of software tools and human experts, the observation is made that “to accurately measure full compliance of webpages, human review of web content is mandatory” (Hong et al., 2008, p. 28). In that study, the researchers used a combination of automated software tools and human review, albeit they were still using *WCAG 1.0* and the *Bobby* software tool. This study reported that longitudinal studies are necessary if researchers are to observe changes in websites’ accessibility over time (Hong et al., 2008).

A doctoral thesis by Sloan (2012) examined methods of evaluating websites for accessibility. The role of automated testing was examined and the author highlighted some of the advantages of using automated tools. Additionally, Sloan referred to studies by numerous authors which showed agreement that automated tools could assist only in identifying the presence of accessibility problems not requiring manual verification. This study utilised *WCAG 1.0* which was not then designed to be testable by automated tools to the same extent as *WCAG 2.0*. Sloan also referred to the fact that barriers detected by automated tools may not always pose a barrier in the accessibility of the website, or its overall usability. A related work by Sloan (2008) also

highlighted the need to combine automated tools with manual inspection methods and user evaluation by people with disabilities.

Casado Martínez, Martínez-Normand and Olsen (2009) considered whether performing an automatic test would accurately predict a website's manual accessibility evaluation result. This research was based on *WCAG 1.0* and was limited in that manual and automatic evaluations of the accessibility of thirty pages of each of two sites were conducted and the results compared. Vigo, Brown and Conway (2013) compared the results of testing three pages of each of three websites, to evaluate the results of nine automated tools. They found that the accessibility of the websites was a factor in the effectiveness of the tools and that automated tools had a better percentage of coverage of the *WCAG 2.0* guidelines on the least accessible websites. They hypothesised that websites with many Level A violations were more easily tested by automated tools than websites having fewer violations. Hence the test by Casado Martinez et al., in examining only two websites, may not have had sufficient scope to provide this analysis. Casado Martinez et al. also stated that "In reality, there is no choice but to rely on automated tools when reviewing large web sites for accessibility" (Casado Martínez et al., 2009, p. 646). This claim is disputed in material from both the Australian Government and the W3C and is analysed in later chapters. They also stated that "Many web sites contain quite a lot of web pages, making it impossible for a detailed manual assessment of a statistically sound selection of pages" (Casado Martínez et al., 2009). However, as this paper was published before *WCAG 2.0* was adopted by the Australian Government, and also before the work on the *WCAG-Evaluation Methodology (WCAG-EM)*, it is understandable that the authors were not familiar with the testability of *WCAG 2.0* or with the sampling methods described in *WCAG-EM* (World Wide Web Consortium, 2014b).

In 2007, the twenty-three campus California State University commenced a program mandated by its Chancellor to ensure that all information technology resources would be accessible to persons with disabilities. The program resulted in a protocol being developed for testing websites, partially based upon the work of Jim Thatcher in his book *Web Accessibility (2006)*. In analysing the outcomes of this project, Jewett and Dick discuss the difficulty of locating accessible learning management systems (LMS). The evaluation protocol was found to be sufficiently robust to identify accessibility barriers for users with disabilities and these barriers could be identified to people who were not accessibility specialists (Jewett & Dick, 2009).

The issue of how organisations make compliance claims about the accessibility of their website was the subject of research by Brown and Conway (2012), described in Section 2.1.5. From this research, it would appear little information has been disseminated to web designers and developers, as the researchers found very little agreement between stated and actual compliance levels.

Brajnik (2008) asserts that a "good method is a dependable tool that yields accurate predictions of all the accessibility problems that may occur in a website." He emphasises that "methods that are based exclusively

on automated testing tools ... should not be considered *evaluation* methods”, and that in a previous study the researchers found that false positives and false negatives result in up to 33% and 35% of cases respectively.

2.1.11 ASSISTIVE TECHNOLOGY

For the purposes of this research, the term “assistive technology” is used to describe technology which assists people to access web-based materials more effectively. The choice of the term “assistive technology” for this study is based on its popular use in the literature. However, it should also be acknowledged that there are some, for example Ladner (2012), who argue that the term “access technology” is more appropriate. As Ladner explains, some people with sensory disabilities regard “assistive” in a negative way as they associate the term with implying a sense of helplessness and the need for assistance. Ladner suggests the term “access technology” is therefore more appropriate since it connotes “...an enabling technology giving access to information and activities that would otherwise be difficult or impossible to obtain without the technology” (Ladner, 2012, p. 959).

In a previous section, mention was made of a paper by Adam and Kreps, which discussed then current discourses on web accessibility as they applied to disability (Adam & Kreps, 2009). They considered the changes in the ways the community regards the needs of people with disabilities. The authors discussed their belief that “the greater portion of the services and interactions available on networked computers has been designed for the able-bodied.” Adam and Kreps (2009, p. 1048) argued that emphasis should be placed more on the development of ICT features that are accessible to a greater range of people than on expecting people with disabilities to work with inadequate technologies and inefficient websites.

In order to assess a website for accessibility, there is little debate regarding the importance of performing a physical inspection. Borodin, Bigham, Dausch and Ramakrishnan (2010) state that “using a screen reader as part of an evaluation process can help web developers perform better validation. Indeed, the W3C and the Australian Government each stipulate that evaluators should not rely entirely on automated website checking tools (Seipel, 1994; W3C, 2013d). Even if automated tools are used, evaluators need to use more than a single tool for result validation. If evaluators intend to use screen-readers or non-visual web browsers, it is necessary for them to understand how users with visual disabilities navigate using assistive technology. In their paper discussing screen-reader browsing strategies, Borodin et al. (2010) present some of the methods that users employ to navigate through web pages efficiently (WAI, 2009). Some of the methods used include Braille displays, increasing speech rate, catering for individual preferences such as navigating by headings, task-based preferences such as ways to navigate through forms, using a keyboard-driven mouse, and utilising volunteers for help when all else fails. This paper also dealt with ways in which applications handle dynamic content, and the role of Accessible Rich Internet Applications (ARIA).

Bradbard and Peters (2010) provided a list of examples of assistive technologies and their use for particular types of disabilities in Table 2-1. It is usual evaluation behaviour, as mentioned, for evaluators to determine whether a web page can be read with screen-reader software. A screen-reader can interpret text but not graphic images. For this reason, it is essential that all non-textual content is presented by some other means that will enable the software to describe the non-textual content. The screen-reader also relies on users navigating by different methods, such as tabbing through the links or via the heading structure, as they are generally unable to use a pointer-specific device such as a mouse.

Ladner (2012) describes five classes of communication access technologies: heading enhancement technology, deaf technology, vision enhancement technology, blind technology and deaf-blind technology. While communication technology has increased rapidly in recent years, much remains inaccessible or only partially accessible for people with sensory disabilities. In the UN *Convention on the Rights of People with Disabilities*, equal importance is placed upon communication and physical access. Specific mention is made of sign language and Braille as modes of communication that should be supported. (Ladner, 2012; United Nations Web Services Section, 2006)

Ladner (2012) provides valuable insights into the different technologies available, the history of communication enhancement and the need for continuing research. The researcher describes the ways in which people with different types of disabilities use the available assistive technologies and what may work best in different situations. Ladner specifically points out that people with sensory disabilities should be more involved in the design process as developers, not merely as users of the end products.

We engineers and innovators need to keep in mind that our technology solutions do not have to focus only on hearing and vision enhancement, but on innovative alternatives that make communication accessible to as many people as possible (Ladner, 2012, p. 971).

Table 2-1 : Assistive Technology Types for Various Disabilities –(Bradbard & Peters, 2010)

Examples of Assistive Technologies for Various Disabilities			
Visual Disability	Auditory Disability	Cognitive Disability	Motor Disability
Screen magnifiers enlarge a portion of the screen as the user moves about the screen. For straight text, users can magnify on screen by zooming	Telecommunications Device for the Deaf (TDD) provides means to communicate over phone lines using text terminals.	Reading tools and learning disabilities programs include software and hardware designed to make text-based materials more accessible for people who have difficulty with reading. Options can include scanning, reformatting, navigating, or speaking text out loud.	Alternate pointing devices enable users with limited or no arm and hand movement to control mouse movements. Examples include foot operated mice, sip-and-puff systems, trackballs, head-mounted pointing devices, and eye-tracking systems.
Screen reader software present graphics and text as speech	Closed captioning provides text translation of spoken material on video media (e.g., distance learning or video conference).	Screen reader software used for visual disabilities is also effective for people with dyslexia.	On-screen keyboards provide the key functions of physical keyboard and are typically used with alternate pointing devices.
Speech recognition systems allow people to make inputs with their voice rather than by mouse or keyboard.	ShowSounds is a standard that provides visual translation of sound information. It is available in Windows XP and Vista. In Vista it is called "Captions."	Speech recognition software can be used by people who find creating written language difficult.	Predictive dictionaries speed typing by predicting words as the user types them and offer words for the user to choose among.
Speech synthesizers allow users to hear the information they put into the computer	Light signaler alerts the user when the computer is emitting sounds such as indicating a new email message.	Software like spell and grammar checkers, writing organizers, time management, and prompters are useful for processing impairments.	Speech recognition enables users to control user interface or enter text via speech
Refreshable Braille displays provide tactile output of information on the computer screen. Lines from the screen are sent to a device where small rounded plastic or metal pins are raised to form Braille characters. The user reads the Braille letters with his or her fingers, and then, after a line is read, can refresh the display to read the next line		Office technology such as email, automatic reminders, and timers can be used for people with memory related impairments.	Keyboard enhancements enable single finger operation of multiple key combos, delay onset of key repeat, bouncekey delays, or onset of inadvertent key presses (users with tremors).
Braille embossers transfer computer generated text into embossed Braille output using a special printer.			
Talking word processors use speech synthesizers to provide auditory feedback of what is typed.			
Large-print word processors allow users to view everything in large text.			

The assistive technologies used in the data collection phase of this study are discussed in chapters three and four.

2.1.12 AUSTRALIAN GOVERNMENT WEB ACCESSIBILITY NATIONAL TRANSITION STRATEGY

While the preceding literature review has examined accessibility in an international and general context, the following relates specifically to Australia's implementation of an approach which reflects its commitment to website accessibility as part of a nation-wide guarantee of equality of access to information and services.

The Australian Government has developed a unique response to the international adoption of website accessibility standards. This has become known as the *Web Accessibility National Transition Strategy (NTS)* (Australian Government Information Management Office (AGIMO), 2010b). As Australia was one of the first signatories to the United Nations' *Convention on the Rights of Persons with Disabilities (UNCRPD)* (United Nations Enable, 2008), the *NTS* contributes to Australia's commitments under Article 21 of that *Convention*. Article 21 specifically refers to the fact that "access to information, particularly access to government information, is considered a basic human right" (United Nations Enable, 2008; van Teulingen, 2013). This is emphasised in the six strategic priorities of the *National Disability Strategy (NDS)* (Australian Government, 2013b). The *NTS* is unique in that it represents:

... the first time in Australia that disability policy is underpinned by a whole-of-government, whole-of-life approach. Its aim is to address four strategic priorities that include: increasing the social, economic and cultural participation of people with disabilities and their families, friends and carers; introducing measures that address discrimination and human rights violations; improving disability support and services; and building in major reform to ensure the adequate financing of disability support over time. (van Teulingen, 2013)

Additionally, Australia's *DDA* (Australian Human Rights Commission; W3C) places a "legislative requirement on organisations, including the public sector, to provide goods and services to all people in ways that do not discriminate due to disability" (van Teulingen, 2013).

In designing the *NTS*, the Australian Government consulted other Australian government ICT governance committees, other countries including the United Kingdom, Canada and New Zealand, and disability agencies throughout Australia. The design of the *NTS* also reflects the outcomes from a number of studies (cited in van Teulingen, 2013) across Australia, including the *eGovernment Benefits Study* (National Office for the Information Economy & DMR Consulting, 2003) which identified usability barriers in the 169 websites studied. The *Web Standards Group (WSG)* (Dispain, 2007), an independent group of web managers within and external to government, examined government home pages and found that only 27% demonstrated valid HTML and that a small number were compliant with the most basic levels of accessibility. In addition, they considered the results of the *Web Watch* program in 2008 conducted by the Australian Human Rights Commission, where a number of inaccessible government websites were publically named. (Australian Human Rights Commission, 2008)

In September 2009, *WCAG 2.0* was formally endorsed as the standard to apply to all Australian government websites. The endorsement by the Secretaries' ICT Governance Board required all Australian government websites to conform with *WCAG 2.0* to Level AA over a four-year period (van Teulingen, 2013). This endorsement included all agencies managed under the *Financial Management and Accountability Act 1997 (FMA Act)*. Agencies managed under the *Commonwealth Authorities and Companies Act 1997 (CCA Act)* were also encouraged to adopt the *NTS* as a "demonstration of their commitment to accessible websites." Additionally, the Online and Communications Council endorsed *WCAG 2.0* and required all federal, state and territory websites to conform to the guidelines to the A level within a two-year period, i.e. by the end of 2012. State and territory jurisdictions were permitted to conform to Levels AA or AAA at their own discretion. However, it was stated that all levels of government should reach Level AA of *WCAG 2.0* within the four-year plan of the *NTS* (Australian Government Information Management Office (AGIMO), 2010b).

The overall goal of the *NTS* was that "all government websites will be more accessible due to their conformance with *WCAG 2.0* (Australian Government Information Management Office (AGIMO), 2010b). Following this decision, AGIMO was given the task of the development and implementation of the *NTS* which would mandate "the implementation and adoption of *WCAG 2.0* to all government online services and information" (van Teulingen, 2013). The *NTS* is modelled on the approach used previously in Australia for implementing ICT standards within government. The approach is three-phased, including stages for preparation, transition and implementation. It sets out a staged four-year plan which establishes milestones designed to lead to a "progressive enhancement of the Australian Government's web environment" (van Teulingen, 2013).

A 2010 *Baseline Report* was conducted and released in 2012 (Australian Government, 2012) This report proceeded from the survey of agency progress conducted at the beginning of 2011 to determine the progress through the preparation phase of the *NTS*. At that time, it was evident to compilers of the *Baseline Report* that agencies were not fully aware of the amount of work that would be required to achieve *WCAG 2.0* compliance at any level. In the *Baseline Report* it was stated "less than half of Australian Government websites conformed to a recognised level of accessibility at December 2010" (Australian Government, 2012). Moreover, the report stated that most agencies did not believe that web applications would be subject to the same requirements. The report also noted the lack of accessibility skills on the part of agencies' staff. While the cost of external providers for accessibility support is high, many continue to require external assistance due to their lack of internal resources.

The following key findings have been extrapolated from the *Baseline Report*:

Accessibility Conformance Check

- 678 (50.7%) of reported websites are not currently assessed for website accessibility or do not claim any *WCAG 1.0* or *2.0* conformance;
- 517 (41.1%) of current websites were reported to conform to *WCAG 1.0*, at varying levels;
- 63 (4.7%) of websites were reported to conform already to *WCAG 2.0* at varying levels; and 80 (6%) reported partial conformance (Australian Government, 2012).

Agencies at the time of the *Baseline Report* stated that the most common and significant risks included funding and resources, shortage of relevant skills, the use of third party products, legacy publishing systems, and agency reliance on the use of non-conforming PDF files as the common web publishing format (Australian Government, 2012).

Significant emphasis has been placed in this literature review on the *NTS*, including its background, goals and a review of the *Baseline Report*. In the discussion section of this thesis, the researcher will refer to the 2012 *Progress Report* (Australian Government, 2013b), particularly as it relates to a comparison with the *Baseline Report*. These findings of the Australian Government are also compared to the results obtained by this research.

3 RESEARCH METHODS AND DESIGN

3.1 INTRODUCTION TO METHODOLOGY AND DESIGN

The principal question addressed in this study was designed to analyse the outcomes of the Australian Government's *NTS*. Therefore, the objectives may be stated as observing the outcomes of the *NTS*. The study's secondary objectives are designed to consider supporting questions related to observing compliance with website accessibility standards by organisations outside the *NTS*. Comparing compliance with website accessibility standards by different types of organisations is also a major focus.

There are many definitions for research. However, the main consensus is that it forms the difference in methods for answering questions which relate to everyday lives and those requiring scientific explanations. The difference between everyday questions and scientific ones is the method used to answer them. Thus the research process must meet specific requirements to be accepted as research (Kumar, 2005, p. 7). Grinnell (Grinnell cited in Kumar, 2005, p. 7) defines research as "structured inquiry that utilises acceptable scientific methodology to solve problems and creates new knowledge that is generally applicable." Clough and Nutbrown (2002) argue that research at this level is more aligned to investigating questions and exploring issues than proving anything. They (2002, p. 4) state that research is about "asking questions, exploring problems and reflecting on what emerges in order to make meaning from the data and tell the research story." According to Clough and Nutbrown, (2002, p. 23) another way of looking at the difference between an interest and a research project is that an interest "starts to become a research proper when that curiosity is systematically informed by perspectives outside the researcher's normal vision ... Where are the gaps and can I add to the public state of knowledge?"

There are a number of ways of viewing research methodology. The predominant view in the past was that research was usually quantitative, supported by the positivist or scientific paradigms, or qualitative, supported by the interpretivist paradigm. These methodologies are mutually exclusive, with the proponents of each often expressing antagonistic views toward the methods of the other (Thomas, 2003, pp. 6-7). Thomas argues that "the best answer frequently results from using a combination of qualitative and quantitative methods" (Thomas, 2003, p. 7). Clough and Nutbrown (2002, p. 17) state that a discussion on methodology is not designed to show how a certain methodology or set of tools is the best for the purpose of the study, but why "*this way of doing it was unavoidable – was required by – the context and purpose of this particular enquiry* [emphasis in original]. This view, that mixed methods research provides an unique opportunity to offset the weaknesses of both quantitative and qualitative methods, is affirmed by Cresswell and Clark (2007, p. 9). Cresswell and Clark argue that quantitative research can miss presenting the voices of the participants and the context or setting, while qualitative research is often seen as less valuable because the personal interpretations made by the researcher may result in bias. In addition, there are some aspects that can only

be viewed with a mixed methods approach. For example, a mixed methods approach could answer the question, "Do the participants' views expressed in the surveys differ from the results obtained in the website audits?" According to Cresswell and Clark, this ability to combine results of both the qualitative and quantitative methods is unique to a mixed methods approach. Morse asserts that the use of multiple tools of both qualitative and quantitative methods is more correctly termed a multi-method research (Morse cited in Cresswell & Clark, 2007, p. 12). However, in keeping with the majority of authors, this thesis will refer to the research as adopting a mixed methods approach.

A view of this mixed methods research approach may be seen in Figure 3-1 which displays the case study methodology containing the longitudinal comparisons.

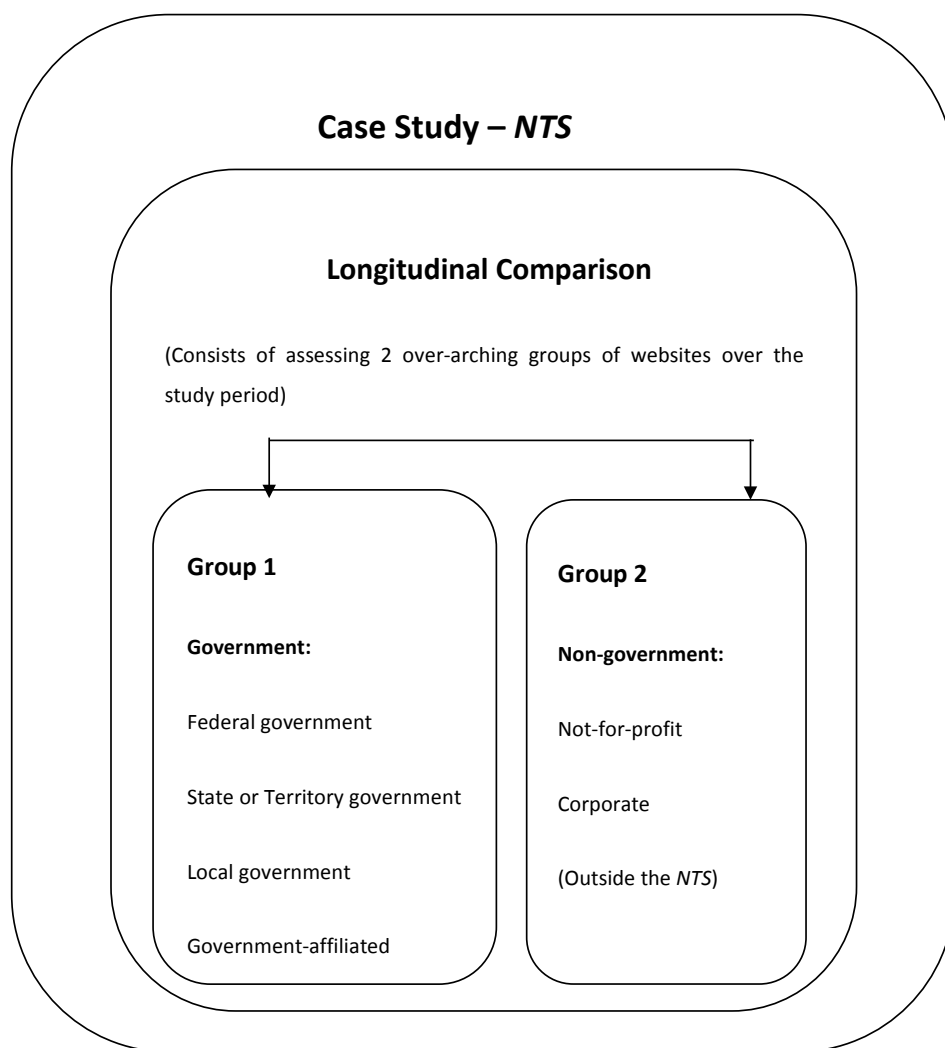


Figure 3-1: Case study encapsulating longitudinal comparison

The case study used a hybrid website evaluation process that employed numerous tools, as discussed in Chapter 3.2 Research Design. Within the case study, there is a comparison of the different categories of websites as shown in Figure 3-1. This comparison took place during the data collection period, during the period of the *NTS* national implementation, i.e. within the longitudinal aspects of the study.

A framework for analysing the applications of research has been developed by Kumar (2005, pp. 4-5) in which the author discusses four perspectives from which research can be viewed. These perspectives include those of:

- the service provider
- the administrator, manager and/or planner
- the consumer and
- the professional

It is the last of these perspectives, the professional, which best reflects the perspective of this research. The questions Kumar posits would be answered from this perspective include:

- Which is the most effective intervention for a particular problem?
- What is the relationship between x and y ?
- How valid is a particular theory in the present conditions?
- What is the best way of measuring attitudes?
- What is the process through which people decide to adopt a program? (Kumar, 2005, p. 5)

This research examined the outcomes of the *NTS* to date and whether it has been an effective strategy for achieving government compliance with website accessibility guidelines. The questions stated by Kumar above appear to be most relevant to this type of study.

When conducting research, researchers are implying that they are proposing to answer questions, by undertaking studies that conform to the following three principles:

1. The research is being conducted within a framework that abides by a set of philosophies which can include the approaches of positivist, interpretive, phenomenological, action or participatory, feminist, qualitative, quantitative and other discipline-specific approaches.
2. The research uses methods, techniques and procedures which have been tested for validity and reliability.

3. The research is designed to incorporate the objectives of being unbiased and objective. While the research will necessarily sometimes incorporate subjectivity as it is an integral part of human conditioning from our background and discipline, it must preclude bias or a deliberate attempt to conceal or highlight specific aspects of the research. (Kumar, 2005, p. 6)

Kumar describes how research can be classified from three perspectives, which are not mutually exclusive. These perspectives include: “the application of the research study, the objectives in undertaking the research and the inquiry mode employed.” (Kumar, 2005, p. 9) Following Kumar’s discussion, the following types of research may be viewed from each of the viewpoints of application, objectives and inquiry mode (Kumar, 2005, p. 9). The different research types outlined by Kumar are also subject to elements of cross-over, with it being common to incorporate numerous methods.

The application perspective classifies the research as either pure research or applied research. This research is mainly applied research in its mode of application. Pure research is usually concerned with the development of research methods. This application, while principally using applied research, does include some aspects of pure research. For example, it depicts the further refinement of the method of website evaluation. Moreover, the hybrid method of website evaluation has been tested in an earlier study of Western Australian public library websites (Conway, 2010). This research extends proven methods rather than developing entirely new research methods.

Research objectives can usually be described as descriptive, exploratory, correlational, or explanatory, with many combinations possible. This research can be viewed as descriptive, as it follows Kumar’s guide of describing what is predominant about a situation or programme (Kumar, 2005, p. 10). In this case, the research is describing the effect of the *NTS* on websites within its jurisdiction and attempts of those responsible to comply with guidelines. It also describes the website compliance of websites outside the jurisdiction of the *NTS* and compares their accessibility with those within the other group. An explanatory study attempts “to clarify why and how there is a relationship between two aspects of a situation or phenomenon” (Kumar, 2005, p. 10). This research attempts to determine if compliance with the website accessibility guidelines differs for those coming under the *NTS* to those websites which have a choice of strategy for achieving accessibility compliance. In a further cross-over, there is also an aspect of exploratory research, in that this is an as yet unstudied area. The *NTS* is a recent initiative and there has not yet been a chance to study the efficacy of this model in Australia. This study divides the six categories of websites into two distinct groups. The government group incorporates federal government websites that are mandated to follow the *NTS*, state or territory, local government and government-affiliated websites that must reach *WCAG 2.0*, but have options including the methods of achieving that goal outside the *NTS*. The non-government group includes websites which are advised by the Australian Human Rights Commission to make the transition to *WCAG 2.0* in order to comply with the *DDA*, but have a choice of mechanisms for achieving that goal

(Australian Human Rights Commission, 2010). Considering the different categories of websites provided the opportunity to explore the outcomes of different strategies for achieving compliance, and whether the category into which the website falls makes a difference in the level of compliance achieved, the time it takes to reach this level, and the obstacles faced. The data collected has been fed into a quantitative reporting structure. This report-card style of structure was designed to enable comparison of scores over time for one website, between websites of the same category and across the entire sample. Kumar (2005, p. 10) strongly encourages researchers to incorporate aspects from each of the descriptive, exploratory and correlational methods, if possible, into the research study, as it is seldom the case that a successful study will rely only one method.

Considering the inquiry mode of research, again there is again a mixture of methods. Clough and Nutbrown (2002, p. 19) describe qualitative inquiry as having an emphasis on entities and processes that are not “experimentally examined or measured ... in terms of quantity, amount, intensity or frequency” and quantitative inquiry as emphasizing “the measurement and analysis of causal relationships between variables, not processes.” Website accessibility evaluation will be largely quantitative with results able to be analysed statistically. It is largely structured, as most aspects will incorporate the use of predetermined tools, objectives, questions and sampling methods. As surveys have also been conducted, a smaller proportion of qualitative data collection was collected from open-ended questions to elicit anecdotal comments from the respondents. One of the most obvious benefits of using quantitative methods is the fact that they support the collection of data that can be analysed according to numbers and frequencies of events and actions. An advantage of collecting qualitative data is that it may be analysed according to influences and patterns and interpreted without concern for quantities (Thomas, 2003, p. 33). Clough and Nutbrown (2002, p. 19) propose that the choice of research paradigm, including the choice of qualitative or quantitative methodology is not the issue. They state that “the issue is not so much a question of which paradigm to work within ... but how to dissolve that distinction in the interests of developing research design which serves the investigation of the questions posed through that research.” Cresswell and Clark (2007, p. 5) support the use of this method of research where “the use of quantitative and qualitative approaches in combination provides a better understanding of research problems than either approach alone.”

Methodologies appropriate to this study, and the ways in which they will interact and inform the research, are presented graphically in Figure 3-2 below. The ways in which Edith Cowan University’s ethics requirements were met, and further reasons for method selection, also follow.

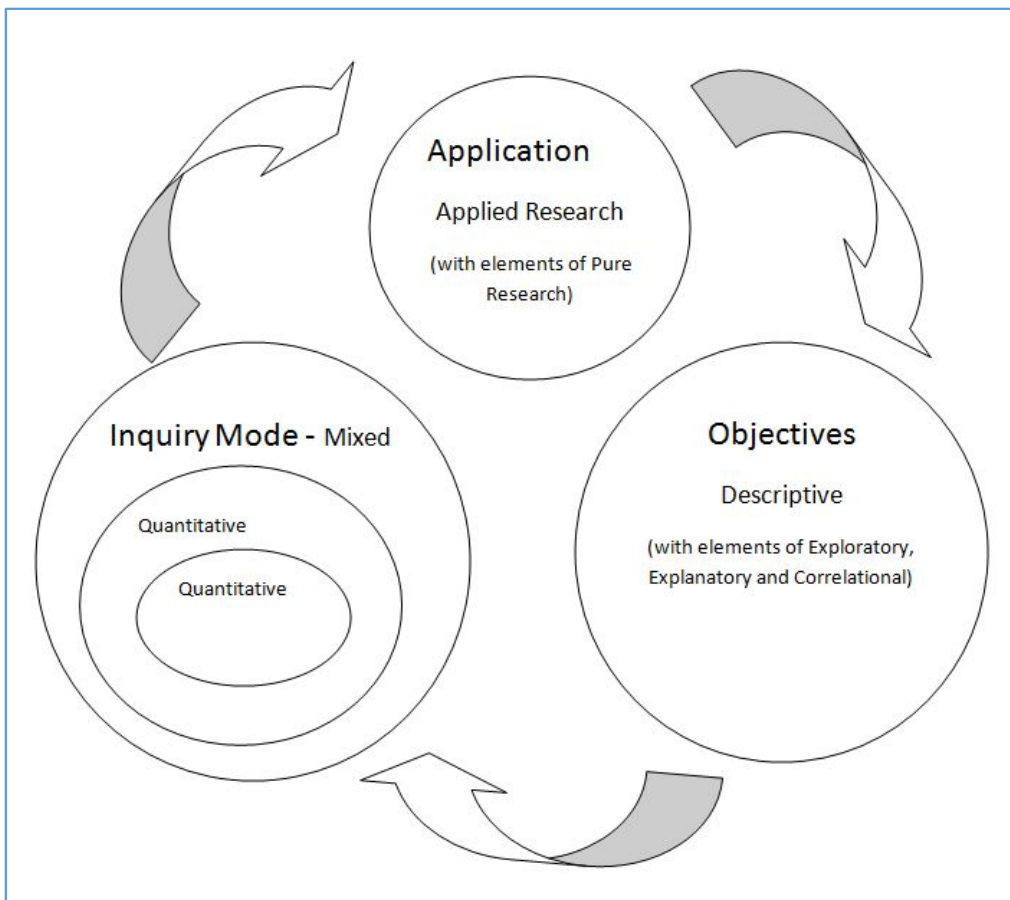


Figure 3-2: Methodology Representation

Preliminary consideration of research methods for this study included modelling and simulation, hypothesis testing, and problem solving, but these techniques were not considered appropriate. This research was designed to observe and document the outcomes of the *NTS*, compare the website accessibility compliance between those websites that fall within the *NTS* and those that do not, and accumulate the results of the research into a format that may be used by developers to assess the accessibility of their websites.

This research largely conforms to the observational method. In other words, the researcher observed—and tested websites in question to determine their compliance with *WCAG 2.0*. In order to comply with Edith Cowan University’s ethics clearance, the researcher agreed that no advice or comments would be provided to owners, regarding the state of their particular websites, during the course of this research. Despite the researcher being approached by a number of the targeted organisations for assistance and advice, a non-interference stance was thereby adopted in order not to influence any website owners or to provide assistance

that might skew the data being collected. All members of the target group received an email, advising them of the structure of the research, including information about the three surveys that would be conducted over the course of the study.

3.2 RESEARCH DESIGN

This research used a large case study incorporating a longitudinal comparison. The case study was designed to incorporate 138 websites from federal, state or territory, and local governments, government-affiliated websites, not-for-profit websites, and corporate websites. As all websites in Australia are now being required by either the *NTS* and/or the *DDA*, which is administered by the AHRC, to make the transition to *WCAG 2.0*, this mix was determined to be the most appropriate. Bouma (2004, p. 89), would describe this research as a “longitudinal comparison study” as it includes comparison of the differences between website accessibility compliance standards of the different types of organisations over time.

The main objective of this research was to determine the outcomes of the *NTS*, with a secondary objective of observing the differences in website accessibility compliance between different categories of organisations. Therefore a case study research design incorporating a longitudinal study was selected, as the principal function of the research was to watch and test a selection of websites over time, without intervention, to determine the outcomes of the *NTS*. The websites chosen represented those that citizens using online services most often require, such as those provided by health, public transportation, banking, and employment services.

3.2.1 MECHANISMS

This research conducted regular audits of 138 Australian websites using surveys to investigate situations that occurred in their transitions to conformance with *WCAG 2.0*. The answers to the supporting questions required the audit results and the surveys’ data if the researcher was to contribute to the development of a methodology for assessing the accessibility of websites, thereby identifying the critical success factors of accessible websites and the barriers encountered by developers in making websites accessible.

3.2.2 SELECTION OF STUDY GROUP

As it was not possible to audit all Australian websites, it was necessary to sample a selection considered most representative of those websites used regularly by members of the public. The group studied was purposely selected from all levels of government as well as government-affiliated, not-for-profit and corporate websites. It was deliberately decided not to use random sampling as the research required similar sites to be selected from each state or territory. In addition, the study group was carefully chosen to reflect those websites with which the public requires the most interaction. Table 3.1 demonstrates the balance of websites selected for

study. A total of 138 websites provides a robust sample size without becoming unmanageable in terms of time and data analysis. Originally the researcher planned to select 100 websites purposely, with the majority being in the government category. This number was extended to 138 to ensure the inclusion of the most representative of the websites accessed regularly by the general public. Seventeen of the target sample were devoted to federal government websites, with forty-two allocated to state or territory governments, six websites from each of the six States and the Northern Territory. The researcher considered that choosing websites which were equivalent, or very similar, from each of the state or territory governments would provide sufficient data to allow comparison of results. The selection included websites most used by members of the public, such as those offering health, public information, disability services and emergency services. The same criteria applied to the federal government websites selected. Local government websites constituted twelve of the target group, representing the two largest local governments from each of the six states.

The websites chosen for the not-for-profit category met the same criteria, in that they are used regularly by the public and are considered necessary for most citizens to conduct their business. The corporate category is made up of large corporations, service organisations, public transportation, taxi, media and connectivity, tourism, and airline companies. The government-affiliated group includes three utility companies and seven universities from across Australia.

Table 3-1: target group of websites

Target group of websites					
Federal Government	State or Territory Government	Local Government	Government-Affiliated	Not-For-Profit	Corporate
Finance	From each of NSW, NT, QLD, SA, TAS, VIC, WA	Capital city and next largest city in terms of population	3 utility companies and 7 universities (ANU plus 1 from each of the states)	Beyond Blue	Main tourism site for each State and the Northern Territory
Human Services	Health			Greenpeace	Services: travel, real estate etc. (8)
Medicare	Disability			Lifeline	Large corporate entities (8)
SBS Television	State Library			Vision Australia	Public transport from each State or Territory(8)

ABC Television	SES			Telethon (WA)	Taxi companies (4)
Prime Minister	Small Business			RSPCA	Phone & Internet (5)
Australian Government	Job Search			ALIA	Media – Television and news (7)
Health & Aging				Silver Chain	
AGIMO				SIDS for Kids	
Education Employment & Workplace					
Immigration & Citizenship					
Job Search					
Employment Services					
Taxation					
Infrastructure & Transport					
Human Rights					
Centrelink					

The seventeen federal government websites were chosen specifically for their relevance to members of the public. As much as possible, the forty-two state or territory websites, not including those from the ACT, were chosen to replicate Federal websites – Health, State Library, Disability Services, Government Jobs, Emergency Services, and Business Development. In the local government category, the two largest cities within each state were selected. Government-affiliates included electricity, water and power websites and the major universities. The nine not-for-profit websites selected represented the author’s understanding of the most well-known of the sector. The corporate group included forty-eight websites, including selections from tourism, service organisations, very large corporate entities, public transportation in the capital city of each state or territory including Canberra, airlines, taxi companies, television stations and other media organisations. Table 3-2 demonstrates the break-down of websites in the sample. Overall, the government category made up 51.45% of the total number of websites, not including government-affiliated which could be argued to belong to either government or non-government. However, as they receive government support and/or funding, it was assumed that government-affiliated sites belonged in the government group, which brought the total of government-related websites to 58.7% of the sample.

The make-up of the study group, demonstrated in Table 3-2, highlights the types of websites selected for comparison. The initial checkpoint of the *NTS* was December 2012 for *WCAG 2.0 A* compliance, with compliance with *WCAG 2.0 AA* required for federal government websites by December 2014. Due to time constraints, and to facilitate a more even comparison, this research used the *WCAG 2.0* Priority Level A and AA guidelines. As the deadline for *NTS*-affected websites falls outside the timeline for this research, it may be prudent to conduct a follow-up study to ascertain which websites achieve Priority Level AA by the December 2014 deadline. However, the results indicate compliance with both Levels A and AA.

3.2.3 WEBSITE AUDITS

Website audits were conducted at regular intervals on a continuous cycle throughout the data collection period. Two manual evaluations were conducted for each of the websites, one at the beginning of the data collection period and one at the end. Seven automated evaluations were also performed, working on a continuous cycle from the beginning of the data collection period. Numerous instances of the automated tool could be run at the same time, making it possible to complete more iterations of the tests. Each audit consisted of the use of an automated tool, a manual expert evaluation including a checklist of important features and techniques, and testing by users with disabilities.

The literature review revealed a lack of widely-accepted existing evaluation methods to enable the researcher to judge the extent to which websites conform to *WCAG 2.0*. Such methods are crucial if the principal focus of this research, evaluating the outcomes of the *NTS*, is to be achieved. The automated tool selected by the researcher was *SortSite* by PowerMapper (Powermapper software, 2010) which has been found in previous research to test *WCAG 1.0* and *2.0*, and *Section 508* (United States Government, 2014), reliably. *SortSite* is

well-tested and is currently being used in a number of international studies (*Declaring conformance on web accessibility*, 2011). The researcher had participated in a previous study where automated tools were compared and it was found that *SortSite* provided a balanced approach to the criteria of completeness, correctness and coverage (Vigo, Brown, & Conway, 2013). The literature review presented different studies of websites, many of which had focused only on the home page. Evidence was cited that a home page is not necessarily indicative of the entire website's accessibility (Stephanie Hackett & Parmanto, 2009). Many of the studies assessed websites for compliance with *WCAG 1.0* only, and many used the software tool, *Bobby*. *Bobby* is no longer freely available but forms part of a suite of tools purchased, and now distributed by IBM, known as the *Rational Policy Tester Accessibility Edition*, costing approximately AUD \$3,600. At the time this research began, there was a shortage of tools which were free, were calibrated to test against *WCAG 2.0* and checked entire websites rather than focusing on a particular page. It was decided not to use a second tool due to the difficulty and expense of obtaining a suitable commercial tool for this purpose.

Automated website accessibility-checking tools play an important role in the overall assessment of a website. An earlier study by Vigo (2009) examined then current methods of determining website accessibility, including an assessment of tools. While that study did not suggest using automated tools in isolation, it did point to their importance as tools which should be used early in the process of removing obvious accessibility problems prior to the more expensive and time-consuming tasks of human expert and user evaluations.

The purpose of automatic accessibility assessment is not to replace traditional accessibility testing methods. It is understood as a key stage where most obvious accessibility barriers can be identified and repaired. This way, manual testing is alleviated and experts can focus on more subtle issues (Vigo, 2009, p. 157).

The manual checklist used in this study included all of the success criteria for *WCAG 2.0* for Levels A and AA which is the highest level required by either the Australian Government or to meet the *Advisory Notes* and thereby comply with the *DDA* (Australian Government, 2013a; Australian Government Information Management Office (AGIMO), 2010b; Australian Human Rights Commission, 2010). The *Advisory Notes* state:

The Commission's advice is that all web resources (including web pages and websites) should achieve a minimum of Level AA conformance in order to be consistent with the Aims and Objects of the *DDA*. In addition, some web resources may need to achieve Level AAA conformance, for example, online resources published by education institutions and which are intended for use by all students studying a particular course. (Australian Human Rights Commission, 2010, Section 4.3.2)

The *WCAG 2.0* document states that even when content conforms to the AAA level it may not be accessible for every individual in every circumstance, or if there is a combination of disabilities. In *WCAG 2.0* and the *WCAG 2.0 Understanding Conformance* document, it is stated that "It is not recommended that Level AAA conformance be required as a general policy for entire sites because it is not possible to satisfy all Level AAA Success Criteria for some content." (W3C, 2008d; World Wide Web Consortium, 2014a). Conversely, while

WCAG 2.0 states that it is not considered possible for every website to meet all of the Level AAA requirements, it can be assumed that it is considered possible for websites to all meet Level AA.

Users of WCAG 2.0 may be confused regarding the difference between the levels of conformance, Levels A, AA and AAA. According to *Understanding WCAG 2.0*, (World Wide Web Consortium, 2014a Section: Understanding Levels of Conformance), the difference lies in five considerations:

- whether the success criterion is essential (in other words, if the success criterion isn't met, then even assistive technology can't make content accessible,
- whether it is possible to satisfy the success criterion for all Web sites and types of content that the success criteria would apply to; e.g., different topics, types of content, types of Web technology,
- whether the success criterion requires skills that could reasonably be achieved by the content creators; that is, the knowledge and skill to meet the success criteria could be acquired in a week's training or less,
- whether the success criterion would impose limits on the "look & feel" and/or function of the Web page, limits on function, presentation, freedom of expression, design or aesthetic that the success criteria might place on authors,
- whether there are no workarounds if the success criterion is not met.

However, as can be seen from the above quotation, it is still not immediately obvious how this translates into the three conformance levels. According to *Understanding Conformance*, the success criteria were assigned to the conformance levels by the WCAG working group after considering the five bullet points above (World Wide Web Consortium, 2014a). The question of how the conformance levels were divided was asked in personal correspondence with Denis Boudreau, Web Accessibility Subject Matter Expert for Deque Systems Inc. (Deque Systems Inc., 2014) Boudreau stated that, in his opinion, the difference is most reflected in the user interface. Boudreau also stated that "most of the visually impactful requirements are in AAA while things in A are pretty subtle visually or completely invisible" (Boudreau, 2014, paragraph 3). Boudreau was convinced that:

... it was never the intent to push cognitive accessibility guidelines to AA and AAA, but ultimately, this is clearly what happened. And it so happens that anything related to helping the user understand the interface is bound to have stronger impacts on the visual, therefore, feeding in my theory about conformance levels and impact on designs (Boudreau, 2014, paragraph 5).

According to Boudreau, whether the developer is trying to achieve Level A or Level AAA conformance depends upon whether accessibility of the website is an afterthought or has been incorporated from the early design stage. “Then you can end up building with AAA requirements in mind and they don’t become such a hindrance, as you design to meet those as well” (Boudreau, 2014, paragraph 4).

Table 3-2 demonstrates some of the methods used in previous studies to evaluate website accessibility. This table shows that most of the studies have tested websites for compliance with *WCAG 1.0*, used one automated tool, usually *Bobby* which is no longer available as freeware, concentrated on the home page, and used some type of sampling to determine which websites in the range should be evaluated.

Table 3-2: Comparison of website evaluation methods

Research	Standard				Automated Tool			Human Evaluation			Extent of evaluation			Choice of websites		
	WCAG 1.0	WCAG 2.0	Section 508	Other	1 st	2 nd	none	Checklist	Screen Reader	User Group	Home page	Selected pages	Entire website	All in range	Sampling	
Kuzma	✓	✓			Ergami											130
Alonso		✓					✓	✓			✓					1 only
Lee	✓				Bobby											✓
Al-Khalifa		✓					✓*				✓					✓
Kopackova	✓				Bobby			✓			✓					39
Nagano				✓												
Hong	✓				Bobby											8
West	✓				Bobby											1687
Loicono	✓				Bobby						✓					100
Conway	✓	✓			SortSite	FAE		✓	✓					✓		✓(31)
Sloan	✓				Bobby	W3C		✓		✓				Not known		14

*no automated tools available in Arabic language, but did validate code against W3C validation site and assistance from Wave toolbar

Table 3-2 demonstrates shows that none of the studies reviewed in the previous chapter adopted a sufficiently robust and comprehensive approach to the evaluation of the websites included in their research.

3.2.4 BEST-PRACTICE WEBSITE EVALUATION TECHNIQUES

The literature review has illustrated the need to assess a multi-page website in the following manner:

- Select all the websites in the range to be studied if the size is practical, or choose websites which are most often accessed by the public.
- If possible, assess the entire website, or at least to the third level of the website remembering that the home page is not indicative of the website’s accessibility (Stephanie Hackett & Parmanto, 2009).
- Use more than one automated tool, to facilitate checking the tools for result validity, as well as using each tool’s strengths (Vigo et al., 2013).
- Test to *WCAG 2.0* Priority Level AA, at least, to meet Australian requirements (Australian Human Rights Commission, 2010).
- Perform a human evaluation, looking for the critical aspects identified in the literature review and especially focusing on the requirements of the W3C WAI documentation. Ensure that the location and

usability of the features are assessed, as well as checking items highlighted as possible errors in the automated reviews (Brajnik, 2008; W3C, 2014).

- If possible, involve user groups in the analysis, possibly using screen-reading software to observe user browsing behaviour and general usability of the website (W3C, 2010a).
- If user-groups using screen-reading software are not available, then perform a website check with either screen-reading software, or browse through a website without the use of a mouse (W3C, 2010a).

3.2.5 SURVEYS

In order to obtain individuals' perceptions about website accessibility, its importance in the website-hosting organisations, and problems with its implementation, special purpose surveys were conducted at the beginning, middle and end of the data collection period. Fowler (2009, pp. 3-4) believes that there are times where this type of survey is the only way to gather the required data. If the data is available from other sources, they should be consulted first, in order to avoid problems with non-response, costs and time (Fowler, (2009, pp. 3-4). As the *WCAG 2.0* guidelines for website accessibility were newly introduced at the time this research began, such necessary data was unavailable. Once the target group of websites was selected, the researcher worked to locate a name and email address for the person responsible for the accessibility of the website. In some cases, the website itself contained the required name and email address, while in others the researcher had to complete an online form requesting this information. All participants received three surveys, to coincide with the beginning, middle and end-points of the research. These surveys provided the researcher with insights that assisted in gathering the data to answer the research questions. When the research commenced, it was anticipated that advantages and disadvantages associated with the *NTS* would become apparent. Whether the results of this type of approach were of benefit to website managers, whether they informed them about difficulties in meeting goals and timeframes, about website evaluation methods and technical difficulties and the methods employed to overcome these difficulties, were all parts of a major focus of this research.

One of the advantages of qualitative research is that it permits the acquisition of the "experience narrative" (Thomas (2003, p. 38). This refers to the collection of data from people who are involved in the event being studied, the purpose of which is to collect "individualistic perceptions." Surveys also contribute valuable quantitative data to the research results. The information gathered from a survey describes the current state of a set of target variables within a particular survey population, and it is then possible to report it in a quantitative form. The survey method will produce benefits if it can be assessed in a numerical form, including percentages, averages, etc. (Thomas, 2003, p. 41)

3.3 DEALING WITH THE DATA

In a mixed methods study, the researcher accumulates a unique set of data. According to Cresswell and Clark (2007, p. 7), this presents an opportunity to present a better understanding of the problem than if either qualitative or quantitative methodology had been used alone. However, finding the appropriate method to merge such data to present meaningful results may be difficult. Cresswell and Clark (2007, p. 7) suggest three methods for merging the data:

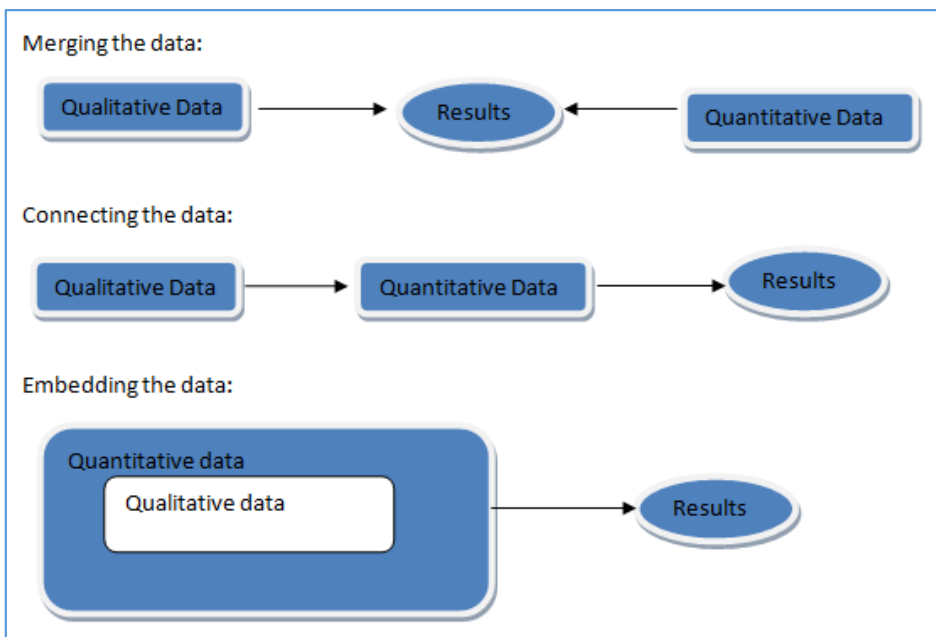


Figure 3-3: Mixed Methods Data

This research used the last method, embedding the data, to present the results as the survey data gathered supported the primary data collected.

3.3.1 REPORTING FORMAT

The data accumulated from the audits was fed into a reporting structure similar to a report card which uses the four principles of *WCAG 2.0*. (W3C WAI, 2008) An example of the reporting format is provided as Table 4.4 in Chapter 4. These four principles which describe a compliant website contribute to the acronym POUR which means the website is:

P – Perceivable

O - Operable

U - Understandable

R - Robust

The reporting structure uses these four headings, and the criteria related to each, to determine a percentage score for each of the headings and a cumulative score for the assessment. This figure was then compared to previous scores for the same website during the time period of the study, and to other websites in the same category and websites across the entire sample group. Collecting this type of data enabled the researcher to determine answers to the principal and supporting questions, including whether the category into which the website fell played any part in its level of compliance, time taken to achieve that level, or obstacles faced in achieving a compliant website.

This data was also instrumental in determining which websites achieved total compliance, those which were close to achieving compliance by reaching 80% to 99% compliance, and those which showed the most improvement over the reporting period.

It was also possible to aggregate the data to determine which of the three website categories had achieved the highest level of compliance and thereby determine whether the group which was subject to the *NTS* had achieved a higher degree of compliance than the other two.

3.3.2 TIMELINE

The timeline for the research closely followed that of the *NTS*. The preliminary period of February to July 2011 was set aside for developing the Ph.D. research proposal which included an in-depth literature review, ethics clearance and candidature approval.

Following approval of candidature, target website owners were contacted by email and then provided with an identification number and a link to the initial survey. The content of the initial email was incorporated in the research proposal and approved by the Ethics Committee at Edith Cowan University. The researcher requested that, if the email had not been sent to the correct person, it be given to the person responsible for the accessibility of the website. However, it was not possible to know who completed the survey, or even whether each of the three surveys was completed by the same person. The researcher was careful to identify the correct person to whom to address the email, but in some cases was advised that it had been forwarded to a more appropriate person. Some of the website owners or managers contacted the researcher to advise who would be completing the survey and would act as the contact person for that organisation. Others advised whether their organisation would or would not be willing to complete surveys, while some had further

questions to ask of the researcher. Copies of the email and the letter of support from the Director, Web Policy – Accessibility, AGIMO are provided in Appendixes 4-23 and 4-24. The targeted websites were audited regularly, on a continuous cycle until the end of the initial transition period to WCAG 2.0 Priority Level A, which was December 2012. At the midpoint of the data collection period, a second survey was conducted. At the beginning of 2013 the third survey was conducted, and the process of statistical analysis of the audit results commenced.

3.3.3 MAPPING RESEARCH QUESTIONS TO ANALYSIS TOOLS

The reporting structure enabled statistical analysis of the data collected, and enabled this data to be aggregated into the two website categories. Figure 3-4 shows the relationship between the research question and supporting questions to the methods of data analysis.

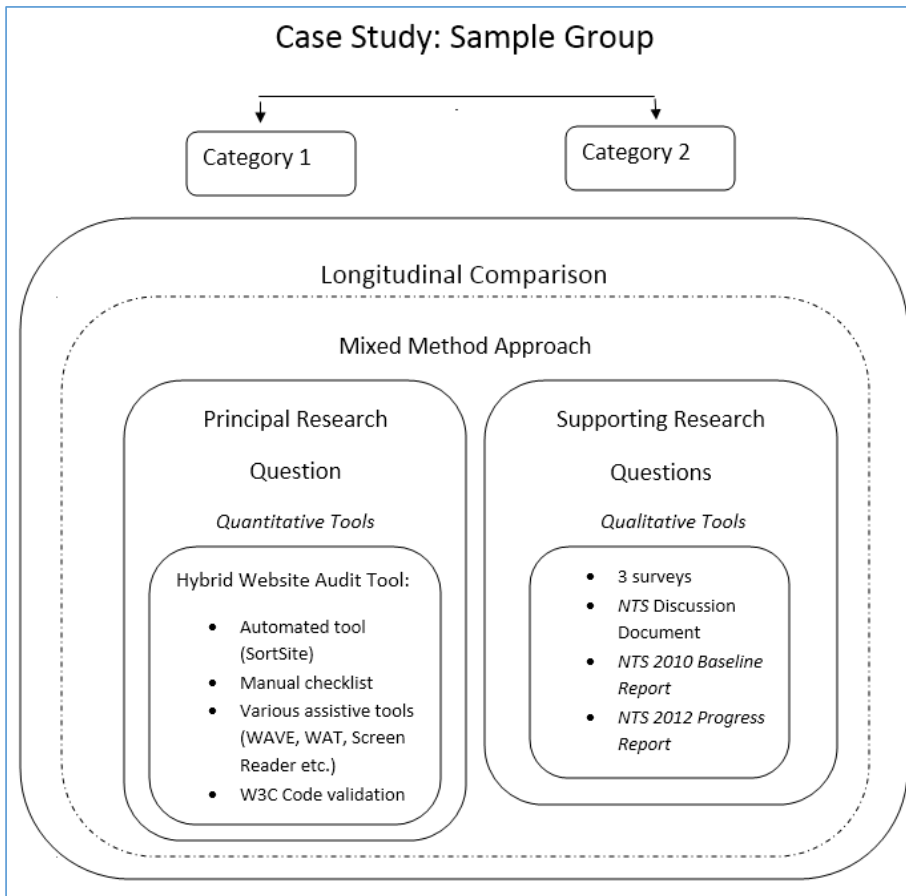


Figure 3-4. Relationship of research questions to methods

3.3.4 SUMMARY

This mixed methods study evaluates the outcomes of the Australian Government's *NTS* in bringing government websites into compliance with recognised standards for website accessibility. An embedded mixed method design was used, a design in which one data set provided a supportive, secondary role in a study based primarily on the other data set. The primary focus of this study was upon website audits as quantitative instruments to test the accessibility of the websites in a longitudinal study, which predicted that the *National Transition Strategy* would influence the outcomes for website accessibility in Australia.

This research:

- Assessed the Australian efforts to bring government websites into compliance with *WCAG 2.0 AA* in a planned, supported manner;
- Assessed how other organisations, also mandated to achieve compliance with these same goals, did so outside the *NTS*;
- Utilised a longitudinal case study to document the transition of websites toward accessibility compliance; and
- Determined critical success factors for organisations achieving website accessibility compliance.

This research provided an analysis of the success of a strategy such as the *NTS*, and demonstrated a methodology to assist organisations to evaluate the accessibility of their websites.

4 WEBSITE TESTING

4.1 INTRODUCTION TO THE DATA COLLECTION

In Chapter 3 the testing methodology used for this research was discussed in detail and the differences in testing were described fully. The methods used to assess the websites follow the guidance in the *WCAG Evaluation Methodology (WCAG-EM)* (World Wide Web Consortium, 2014b). The mixed method approach adopted ideally involves automated tools where applicable, human evaluators with the required expertise, review teams and users including people with disabilities and senior citizens. *WCAG-EM*, recently published as a normative document by W3C, was used in a study by Wood et al. when evaluating the accessibility of the websites of the three major political parties in Australia. The authors of this study also followed the advice of *WCAG-EM* and tested their websites by people with disabilities. (Wood et al., 2013) In an effort to ensure as comprehensive an evaluation as possible of the target group, this research has utilised as many of these strategies as possible – an expert manual evaluator, automated tools and users with disabilities.

Chapter 4 presents the results of the data collection, including manual expert evaluation, user testing and automated testing. The results of the surveys are presented in Chapter 5. Further detailed discussion of the merits and limitations of the different testing methods, and how they are best combined, is provided in Chapter 6, Discussion.

4.2 COMPARISON OF TESTING METHODS

This research used a mixed methods approach:

- Manual expert evaluation (quantitative)
 - Evaluation one at the beginning of the data collection phase
 - Evaluation two at the end of the data collection phase
- User testing (qualitative and quantitative)
 - Conducted gradually over the data collection phase
- Automated testing (quantitative)
 - Seven rounds of testing commencing at the beginning of the testing phase with test seven at the end of the data collection phase
 - Round 1 of the data testing has not been included for reasons stated in Chapter 5
- Three surveys (qualitative)
 - Beginning, middle and end of the data collection phase

The literature review in Chapter 2 provided justification for the mixed evaluation methods approach used in this research. Chapter 6 discusses the problems with sole reliance on automated tests. The remainder of this chapter deals with a discussion of the data derived from the research and its relevance to the principal and supporting research questions.

Manual expert evaluation has a number of benefits and drawbacks which are delineated in Table 4-1.

Table 4-1: Manual expert evaluation: benefits and limitations

Benefits	Limitations
It provides a more thorough analysis of the pages in the sample than other methods	Cost – manual expert evaluation is one of the most costly forms of testing due to the time it takes an evaluator to test a page
Usually involves testing with assistive software	Time – takes from one to three hours per page for thorough testing and this might limit the number of pages that can be tested, owing to budgetary restrictions.
Identifies and verifies accessibility violations raised by automated testing	Expertise required –trained evaluators who need to be knowledgeable about WCAG 2.0 and about HTML, CSS, assistive technologies, the needs of people with disabilities, and the methods that people with disabilities use to access the Web
Should provide recommended strategies to remedy problems located and identify the location of the error	Can be limited in scope – a sample is usually involved as it is not usually feasible to test every page on a website
It is easier to find content which depends upon user input, e.g. dynamically-generated content	
Should be able to provide best practice guidance	

4.3 MANUAL TESTING AND THE WCAG 2.0 GUIDELINES

Manual testing of the websites in the sample commenced in September 2011. Once all the websites were evaluated, the cycle was repeated with the final testing completed in April 2013.

All of the five pages examined from each of the websites in the target sample were tested against the Level A and AA success criteria (POUR principles) of WCAG 2.0. The following discussion outlines the success criteria, against which the websites were tested, and how they relate to the principles mentioned previously.

During this study, the researcher did not use the twenty AAA success criteria as the Australian website accessibility standards did not require AAA compliance. Table 4-2 demonstrates the number of criteria for each of the four POUR principles and the levels. The discrepancies in the number of success criteria under the different levels are evident. These discrepancies need to be kept in mind when reviewing the concentration of accessibility violations under both the perceivable and operable principles.

Table 4-2: Division of principles and levels

Principle	Level A	Level AA	Level AAA
Perceivable	9	5	8
Operable	9	3	8
Understandable	5	5	7
Robust	2	0	0
Totals	25	13	23

Table 4-2 provides the four principles, twelve guidelines and sixty one success criteria that together with their sufficient techniques, advisory techniques and failures form WCAG 2.0. Further discussion on recommendations regarding the applicability of conformance with Level AAA from the Australian Human Rights Commission (Australian Human Rights Commission, 2010) was provided in Chapters 1 and 2.

In Table 4-3, all of the success criteria which make up WCAG 2.0 are provided with the level to which they belong. Those belonging to the perceivable principle begin with the number 1, to operable with 2, to understandable with 3 and to robust with 4. In order to pass Level AA, all of the Level A success criteria must be fulfilled and in order to pass Level AAA, all of both A and AA must be fulfilled. This prohibits the possibility of an organisation skipping Level A and deciding to concentrate on AA instead, believing that by satisfying AA, they have avoided the need to comply with the lower level.

Table 4-3: WCAG Principles and Guidelines

WCAG 2.0 Principles and Guidelines	Level
1. Principle: Perceivable	

1.1. Text Alternatives	
1.1.1. Non-text Content -	A
1.2. Time-based Media: Provide alternatives for time-based media	
1.2.1. Audio-only and video-only (Pre-recorded)	A
1.2.2. Captions (Pre-recorded)	A
1.2.3. Audio description or media alternative (Pre-recorded)	A
1.2.4. Captions (Live)	AA
1.2.5. Audio description (Pre-recorded)	AA
1.2.6. Sign language	AAA
1.2.7. Audio description (Extended)	AAA
1.2.8. Full text alternative	AAA
1.2.9 Live audio only	AAA
1.3. Adaptable	
1.3.1. Info and relationship	A
1.3.2. Meaningful sequence	A
1.3.3. Sensory characteristics	A
1.4. Distinguishable	
1.4.1. Use of colour	A
1.4.2. Audio control	A
1.4.3. Contrast (Minimum)	AA
1.4.4. Resize text	AA
1.4.5. Images of text	AA
1.4.6. Contrast (Enhanced)	AAA
1.4.7. Low or no background audio	AAA

1.4.8. Visual presentation	AAA
1.4.9. Image of text (No exception)	AAA
2. Principle: Operable	
2.1. Keyboard Accessible	
2.1.1. Keyboard	A
2.1.2. No keyboard trap	A
2.1.3. Keyboard (No exception)	AAA
2.2. Enough Time	
2.2.1 Timing adjustable	A
2.2.2. Pause, stop, hide	A
2.3. Seizures	
2.3.1. Three flashes or below threshold	A
2.3.2. Three flashes	AAA
2.4. Navigable	
2.4.1. Bypass blocks	A
2.4.2. Page titled	A
2.4.3. Focus order	A
2.4.4. Link purpose (In context)	A
2.4.5. Multiple ways	AA
2.4.6. Headings and labels	AA
2.4.7. Focus visible	AA
2.4.8. Location	AAA
2.4.9. Link purpose (Link only)	AAA
2.4.10. Section Headings	AAA

3. Principle: Understandable	
3.1. Readable	
3.1.1. Language of page	A
3.1.2. Language of parts	AA
3.1.3. Unusual words	AAA
3.1.4. Abbreviations	AAA
3.1.5. Reading level	AAA
3.1.6. Pronunciation	AAA
3.2. Predictable	
3.2.1. On focus	A
3.2.2. On input	A
3.2.3. Consistent navigation	AA
3.2.4. Consistent identification	AA
3.2.5. Change on request	AAA
3.3. Input Assistance	
3.3.1. Error identification	A
3.3.2. Labels or instructions	A
3.3.3. Error suggestion	AA
3.3.4. Error prevention (Legal, financial, data)	AA
3.3.5 Help	AAA
3.3.6 Error prevention (All)	AAA
4. Principle: Robust	
4.1. Compatible	
4.1.1. Parsing	A

4.1.2. Name, Role, Value	A
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4.3.1 MANUAL EXPERT EVALUATION

In order to perform the manual testing, a list of the *WCAG 2.0 Principles and Guidelines* was created as a recording document. As far as possible, five pages which served similar functions were selected from each of the websites in the sample. These consisted of the home page, the contact page, a page with images, a page with multimedia or complex content such as forms or tables, and a page which described the organisation’s services. It was generally possible to locate pages in the websites sampled that fitted into these categories. In the actual testing, each of the five pages were assessed against the criteria, the results were recorded, and the scores for the five pages were aggregated and averaged to provide a score for that website’s manual accessibility assessment. This process was repeated for the second evaluation at the end of the data collection period. In some cases, the website had changed, been redeveloped, or a particular page removed. In these cases, the same procedure for selecting the page was used in order to replicate as nearly as possible the accessibility of the page used in the first test. The need to locate substitute pages most often occurred with pages chosen for images and multimedia or complex content.

In the manual evaluation, the researcher used the *WCAG* success criteria and recorded the number of violations for each point and page and added specific notes to enable comparisons during the second evaluation. The NVDA screen-reader was used in conjunction with a visualisation tool (WAVE) and keyboard-only navigation. These tools are part of the repertoire of the user testing team. By using them, the researcher was able to observe how purely technical violations might prevent a person with disabilities from assessing content (NVAccess, 2014; WebAIM, 2012b).

In order to demonstrate the manual testing, an image of the *Before & After Demonstration (BAD)* example from the W3C website (W3C, 2012b) is provided as Figure 4-1, together with an accompanying report. The researcher’s scoring sheet for this page is also included. In the *BAD* example, the annotations have been preserved along with the tip for the first accessibility violation, “01: Image with incorrect text alternative”.

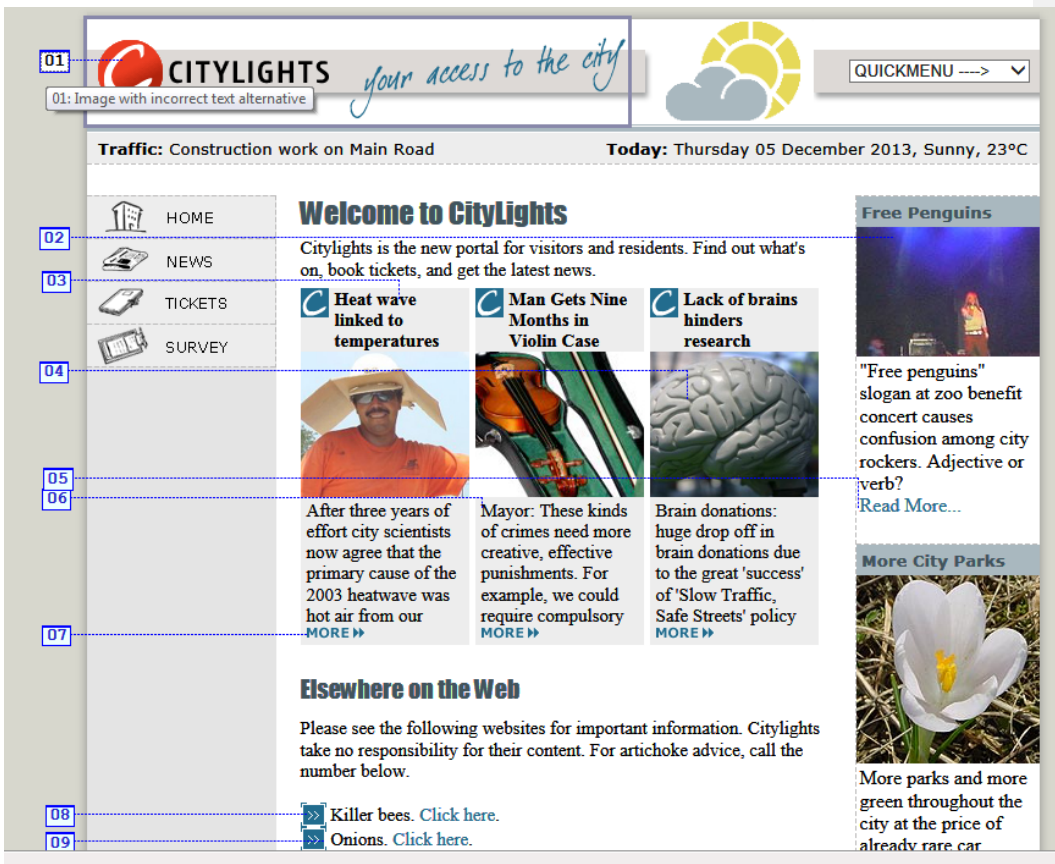


Figure 4-1: Annotated BAD Example

The BAD example provides an annotation of the actual violations present on the page together with explanations in a report or by the links, as shown in Figure 4-1. The report is divided into the POUR principles of WCAG 2.0 previously discussed.

The researcher used a WCAG 2.0 checklist to record all accessibility violations and the results were then transferred into the summary sheet provided a little later in Figure 4-3. As an illustration of the technique used, the checklist for the BAD Home page is provided in Table 4-4.

Table 4-4: Manual Website Evaluation Checklist

Manual Website Evaluation			
Website name: <i>W3C Before & After Demonstration (BAD) Home page</i>			
Page URL: http://www.w3.org/WAI/demos/bad/before/reports/home.html			
Scoring method: Score 1 point for each failure.			
	Level	Number	Description
1. Principle: Perceivable			
1.1. Text alternatives			
1.1.1. Non-text content			
There is a meaningful and equivalent alternative for all non-text content, such as images, graphics, objects, graphic controls in forms and hotspots in image maps.	A	8	Images without alternative text including images that are purely decorative and should have a null (alt="") alternative. failure 20, not updating text alternatives when changes to non-text content occur failure 30, using text alternatives that are not alternatives (filenames or placeholder text) failure 39, using text alternatives that are not null for images that should be ignored by assistive technology failure 71, using text look-alikes to represent text without providing a text alternative relates to the telephone number at the bottom of the page which is outdated or a placeholder, and failure 3, using CSS to include images that convey important information
If the alternative text is not sufficient for the text alternative, a long description is prepared and is referred to in the alternative text.	A		
Decorative graphics or layout graphics have empty alt attributes or they are concealed from assistive technologies (e.g., screen readers) in some other way.	A		
There are no graphic CAPTCHAs or an alternative is present.	A		

Total for 1.1			8	
1.2. Time-based media: Provide alternatives for time-based media				
1.2.1. Audio-only and Video-only (Pre-recorded)				
<i>If audio or video media are not an alternative to the content, the following applies:</i>				
There are text transcripts for pre-recorded audio media.	A			
There are text transcripts for pre-recorded video media, or	A			
Pre-recorded video media have text transcripts or audio descriptions.	A			
1.2.2. Captions (Pre-recorded)				
Pre-recorded video content has simultaneous subtitles.	A			
1.2.3. Audio description or media alternative (Pre-recorded)				
Pre-recorded audio media (e.g., podcasts) have written text transcripts.	A			
Pre-recorded video media have written text descriptions or audio descriptions.	A			
1.2.4. Captions (Live)				
Live audio media have simultaneous subtitles.	AA			
1.2.5. Audio description (Pre-recorded)				
Pre-recorded video media have audio descriptions of visual content that is not described in the standard audio description (SC 1.2.1).	AA			

Total for 1.2			0	
1.3. Adaptable: Create content that can be presented in different ways (for example, simpler layout) without losing information or structure.				
1.3.1. Info and Relationship				
A. Headings				
Headings make the structure of the document clear.	A		1	Changing text presentation to convey information without using the appropriate mark-up or text relates to the three columns of text that appear to be visually distinct but according to the mark-up code they appear as one piece of running text.
Headings are marked up using the heading element (h1, h2, ..., h6).	A			
B. Lists				
Listed information is formatted as a list (ul, ol, dl).	A		1	Failure 2: list not marked up as such, failure is due to using changes in text presentation to convey information without using the appropriate mark-up or text. "Killer bees" and "Onions" are formatted to resemble a list visually, but the structural information is not represented in the HTML code.
C. Forms				
In forms with multiple parts, the parts are grouped by content into information blocks.	A			
Labels and related form input fields are logically linked.	A			
D. Data tables				
Data tables are formatted with the necessary mark-up, e.g., headings for columns; rows and tables are clearly labelled, and headings and summaries are present.	A			
Data tables can be read serially and are not used for layout purposes.	A			

E. Use of symbols				
Special text is correctly formatted, e.g., citations with cite and long quotations with blockquote	A			
1.3.2. Meaningful Sequence				
The logical order is retained for screen readers and when CSS is turned off.	A	2		Relates to above: Failure 1, changing the meaning of content by positioning information with CSS, and failure 49, using HTML layout table that does not make sense when linearized.
Contents in tables are correctly linearized and no empty cells are used to create space in the layout.	A			
No character spaces are used to create space in the layout; CSS is used instead.	A			
There is no contextual confusion caused by content positioned with CSS.	A			
1.3.3. Sensory Characteristics				
There are no instructions that are solely optical or acoustic, e.g., "Press the green button on the left".	A			
Total for 1.3		4		
1.4. Distinguishable: Make it easier for users to see and hear content including separating foreground from background.				
1.4.1. Use of Colour				
Information is not communicated solely based on colour.	A			
If colour alone is used for differentiation, e.g., for links in a text, the links have a contrast ratio to the surrounding running text of at least 3:1.	A			

1.4.2. Audio control				
If audio plays automatically for more than 3 seconds, a stop button is provided.	A			
1.4.3. Contrast (Minimum)				
The contrast ratio of the font colour to the background colour is at least 4.5:1.	AA			
The contrast ratio of the font colour of large fonts (at least 18 pt or 14 pt for bold text) to the background colour is at least 3:1.	AA			
This applies to all text and tips, as well as to the borders around input fields and texts in information graphics. Does not necessarily apply to logos, logotypes or purely decorative graphics.	AA			
1.4.4. Resize Text				
The font size is defined in the CSS in terms of % or em.	AA			
It is possible to enlarge either the contents of the entire page or the text alone using the browser's zoom function.	AA			
1.4.5. Images of Text				
<i>Text is used instead of text graphics for content. Exceptions:</i>				
The display size of content can be scaled, and the content can be read without CSS.	AA			
The content is necessary, such as a logo or brand name (e.g., if a particular graphical form is required). They can be described either with alt attributes or title attributes.	AA			

Total for 1.4			0	
Total for Principle 1			12	
2. Principle: Operable				
2.1. Keyboard accessible: Make all functionality available from a keyboard				
2.1.1. Keyboard				
<i>The following can be navigated and operated using the keyboard (tab key):</i>				
All page functions and elements.	A			
All form input fields, controls and switches.	A			
No particular timing of individual keystrokes is needed for operation.	A			
2.1.2. No Keyboard Trap				
The keyboard focus is not blocked for any element of the website.	A			
The user can move focus to and from every element using the keyboard.	A			
The user is advised if keyboard keys other than the conventional ones are used (tab key, arrow keys).	A			
Total for 2.1			0	
2.2. Enough time: Provide users enough time to read and use content				
2.2.1 Timing Adjustable				
<i>There is no time limit for pages. Exceptions:</i>				
The user can turn off the time limit before encountering it.	A			

The user can adjust the time limit before encountering it.	A			
2.2.2. Pause, stop, hide				
<i>The following applies to any auto-updating, moving or flashing information that starts automatically and is presented in parallel with other content for longer than 5 seconds:</i>				
The user can use some mechanism to stop, close or hide the information.	A			
A mechanism is provided for automatic updates, so that the user can stop or hide the update or control its frequency.	A			
Total for 2.2			0	
2.3. Seizures: Do not design content in a way that is known to cause seizures				
2.3.1. Three Flashes or Below Threshold				
Websites contain nothing that flashes more than three times a second on an ongoing basis, or the flash is below a defined limit for flashes.	A			
Total for 2.3			0	
2.4. Navigable: Provide ways to help users navigate, find content and determine where they are				
2.4.1. Bypass blocks (1 point for either)				
Skip links are made available to avoid repeated blocks of information	A			
Repeated blocks of information are grouped or labelled using headings.	A			

2.4.2. Page Titled				
Web pages have a title (title tag in the meta area) that describes the topic or purpose.	A			
2.4.3. Focus Order				
The order of links in the navigation and in the content is logical.	A			
2.4.4. Link Purpose (In Context)				
Link texts can be understood either alone or based on the context.	A	2		Failure 63: "Read more" is not descriptive
A change in format is indicated by the link text or the context.	A	3		Links are not visually distinct e.g. "heat wave linked to temperature" resembles a heading and will not be recognised as a link by many readers Failure 89, "MORE" is an image that has an empty text alternative but is the only content in the link, means the purpose of the link would be unclear to some users.
2.4.5. Multiple Ways				
<i>In addition to navigation, the website presents at least one other method for accessing content:</i>				
A search function or	AA			
A sitemap / table of contents or both	AA			
2.4.6. Headings and Labels				
<i>Informative page headings and labels are used:</i>				
The website has headings that group the content.	AA			
The headings describe the subsequent section of content concisely and meaningfully.	AA			
Descriptive labels are present in forms.	AA			

The functions or instructions are labelled, and active zones can be recognised on image maps and maps.	AA			
2.4.7. Focus Visible				
Elements with focus are visibly emphasized when they are activated using the keyboard.	AA			
Skip links become visible when they receive keyboard focus.	AA			
Total for 2.4			5	
Total for Principle 2			5	
3. Principle: Understandable				
3.1. Readable: Make text content readable and understandable				
3.1.1. Language of Page				
Every web page has a correct language declaration.	A			
3.1.2. Language of Parts				
Sections of text in languages other than the default language are marked up using the lang attribute.	AA			
Individual words in another language that could be understood incorrectly or not at all are marked up using the lang attribute.	AA			
Total for 3.1			0	
3.2. Predictable: Make web pages appear and operate in predictable ways				
3.2.1. On Focus				
Context does not change when a section of the page receives focus.	A			

3.2.2. On Input				
Changing the setting of any user interface component does not automatically cause a change of context unless the user has been advised beforehand.	A			
3.2.3. Consistent Navigation				
Navigation within a website is structured and arranged consistently.	AA			
3.2.4. Consistent identification				
Elements with the same function are identified consistently within a website.	AA			
Total for 3.2			0	
3.3. Input Assistance: Help users avoid and correct mistakes				
3.3.1. Error identification				
If input errors are automatically detected, the error is clearly described in text form in the error message.	A			
3.3.2. Labels or instructions				
Labels or instructions are given when user inputs are required.	A			
3.3.3. Error Suggestion				
Suggested corrections are made in case of input errors.	AA			
3.3.4. Error prevention (Legal, financial, data)				
It must be possible to check, change, delete or confirm inputs that have legal or financial consequences before sending.	AA			

Total for 3.3			0	
Total for Principle 3			0	
4. Principle: Robust				
4.1. Compatible: Maximize compatibility with current and future user agents, including assistive technologies				
4.1.1. Parsing				
The markup language used, HTML or XHTML, conforms to standards and is free of errors.	A			
4.1.2. Name, Role, Value				
In case of generated and self-programmed content, mark-up is used in a way that supports accessibility.	A		3	Failure 89, due to using null alt on an image where the image is the only content in a link, and not updating text alternatives when changes to non-text content occur.
Total for 4.1			3	
Total violation score for each page			20	

Every occurrence of a *WCAG* violation incurred a single point, for example 8 violations for success criteria 1.1 have been recorded above. It should also be noted that some issues will cause multiple *WCAG* violations. For example Figure 4-2 has been taken from the *BAD* example for the reading sequence not being meaningful which would fail criteria 1.3.1 (Info and relationships) and 1.3.2 (Meaningful sequence).

Note 06: Reading sequence not meaningful

These three columns of text appear to be visually distinct but according to the markup code they appear as one piece of running text. They would read as follows:

"After three years of effort city scientists now agree that the primary cause of the 2003 heatwave was hot air from our Mayor: These kinds of crimes need more creative, effective punishments. For example, we could require compulsory Brain donations: huge drop off in brain donations down due to the 'success' of 'Slow Traffic, Safe Streets' policy"

Success Criterion 1.3.1 - Info and Relationships

Failure 2: Failure of Success Criterion 1.3.1 due to using changes in text presentation to convey information without using the appropriate markup or text

Success Criterion 1.3.2 - Meaningful Sequence

- **Failure 1:** Failure of Success Criterion 1.3.2 due to changing the meaning of content by positioning information with CSS
- **Failure 49:** Failure of Success Criterion 1.3.2 due to using an HTML layout table that does not make sense when linearized

Figure 4-2: Note for multiple violations from BAD example from (2012b)

After recording the violations for the page, the results were fed into the summary sheet shown in Figure 4-3. In order to allow the researcher to access the data for each of the POUR principles and also to separate the actual WCAG 2.0 violations from the penalty points for violation of WCAG critical criteria and reliance on supported technology. It was then possible to analyse this data separately to see whether the ranking of the website changed when the penalty impositions were removed. Further discussion of the penalty system is explained in the section following.

After the five pages were analysed and scored, the aggregated results were averaged to compute a page score for the website. This score was then available to be compared against the results of the second manual evaluation. This allowed the researcher to see whether the results were improving or deteriorating over the research period. It also allowed an examination of the areas in which improvement or otherwise occurred; for example, in the perceivable principle or, even more specifically, examining issues such as alternative text for images to see if there were more or fewer occurrences of images with missing or inappropriate alternative text. Critical issues, such as keyboard traps that were located by the first evaluation, could be checked during the second evaluation to see if they had been rectified.

Manual Website Evaluation					
Study Number:					
Website name: <input type="text"/>					
URL's examined:					
		Scoring Key			
1 Home Page		0-n		Score 1 point for each failure	
2 Contact -				Score 5 points for each critical failure	
3 Photos -				Score 5 points for each use of unsupported technology	
4 Multimedia -					
5 Services-					
<p>Critical Failures which would cause a whole page to fail: 1.4.2 - Audio Control, 2.1.2 - No Keyboard Trap, 2.2.2 - Pause, Stop, Hide. 2.3.1 - Three Flashes or Below Threshold, and ** 5 additional points for each occurrence * e.g. PDF without alternative</p>					
Page	Data Collection Dates		Critical Error Desc	# of errors x 5 points	
	Score	1		2	# of errors x 5 points
Page 1					
1: Perceivable		0	0		
2: Operable		0	0		
3: Understandable		0	0		
4: Robust		0	0		
Reliance on unsupported technologies	*				
Violation of critical WCAG 2.0 criteria	*				
Overall Score		0	0		
Page 2					
1: Perceivable		0	0		
2: Operable		0	0		
3: Usable		0	0		
4: Robust		0	0		
Reliance on unsupported technologies	*				
Violation of critical WCAG 2.0 criteria	*				
Overall Score		0	0		
Page 3					
1: Perceivable		0	0		
2: Operable		0	0		
3: Understandable		0	0		
4: Robust		0	0		
Reliance on unsupported technologies	*				
Violation of critical WCAG 2.0 criteria	*				
Overall Score		0	0		
Page 4					
1: Perceivable		0	0		
2: Operable		0	0		
3: Understandable		0	0		
4: Robust		0	0		
Reliance on unsupported technologies	*				
Violation of critical WCAG 2.0 criteria	*				
Overall Score		0	0		
Page 5					
1: Perceivable		0	0		
2: Operable		0	0		
3: Understandable		0	0		
4: Robust		0	0		
Reliance on unsupported technologies	*				
Violation of critical WCAG 2.0 criteria	*				
Overall Score		0	0		
Total Score		0	0		
Average		0	0		

Figure 4-3: WCAG 2.0 Checklist Summary Page

4.3.2 PENALTY SYSTEM FOR CRITICAL FAILURES AND UNSUPPORTED TECHNOLOGY

Throughout this study, a penalty of five points per violation was imposed for each of the *WCAG 2.0* critical failures and also for the use of unsupported technology. In particular, unsupported technology included the use of a PDF without an accessible alternative, such as an accessible Microsoft Word or rich text format (RTF) document or HTML file. The individual documents were not assessed for accessibility; it was merely noted whether there was an alternative that could be made accessible. As some of the websites had more than 30 PDF documents, it was not possible in the time to check them all, especially as the researcher was checking five pages from each of the 138 websites.

The decision to impose the penalty for the reliance on unsupported technology was reached partly because of *WCAG* guidance on meeting conformance requirement 4. *Only Accessibility-Supported Ways of Using Technologies* (World Wide Web Consortium, 2008). The Australian Government Information Management Office (AGIMO), responsible for implementing and monitoring the *NTS*, decided that all PDF documents should be accompanied by a more accessible alternative. This decision was reviewed in 2013 and AGIMO has now updated *its Web Guide* (Australian Government, 2013c) to read that an accessible alternative is required for every PDF. This decision reinforces AGIMO's contention that it is not possible to rely on PDF as the sole publishing format and to claim that web content is *WCAG 2.0* conformant. Another of the main issues is the lack of accessibility support on mobile devices. (Australian Government, 2013c; vanTeulingen, 2014) The penalty was imposed to determine the effect that reliance on PDF without an alternative, or any other unsupported technology, could have on the overall accessibility of the websites.

Justification for the decision to impose this penalty for critical failures was found in the *WCAG* document (W3C, 2008b) which states:

In addition, the following success criteria apply to all content on the page, including content that is not otherwise relied upon to meet conformance, because failure to meet them could interfere with any use of the page:

- 1.4.2 - Audio control,
- 2.1.2 - No keyboard trap,
- 2.3.1 - Three flashes or Below threshold, and
- 2.2.2 - Pause, stop, hide.

Note: If a page cannot conform (for example, a conformance test page or an example page), it cannot be included in the scope of conformance or in a conformance claim (W3C, 2008d).

Therefore, if a page has any of these errors, it may not claim any level of WCAG conformance.

The following excerpt is taken from the Australian Government's *Web Guide* and details clearly the need for alternatives for PDF documents:

ALTERNATIVE FORMATS

Until otherwise stated, agencies must not rely upon any web technology that cannot claim WCAG 2.0 conformance. That is, any technology may be used, but where it cannot prove its accessibility support, agencies must provide multiple accessible formats. Web technologies that claim accessibility support must prove WCAG 2.0 conformance through the use of WCAG 2.0 sufficient techniques.

Agencies are reminded that it is still a requirement to publish an alternative to all PDF documents (preferably in HTML). Recommendations of the *PDF Accessibility Review Study* were focused on providing better education for the creation of more accessible PDFs. Agencies are encouraged to use the slides and information from the series of *PDF Accessibility Education Sessions for the Australian Government* to help improve the accessibility of the PDF documents they create.

Agencies must abide by the Australian Human Rights Commission's *Disability Discrimination Act Advisory Notes* in order to mitigate risk of disability discrimination complaint. Agencies must provide other alternative formats upon request, but should not rely on this defence, nor consider it an appropriate long-term solution to providing accessible versions. Alternative formats should always be published at the same time (Australian Government, 2011, 2013c).

In Chapter 4.3.3, manual testing results with and without the penalties discussed above are compared in order to determine whether violations of these particular criteria relate to the overall accessibility scores for the websites. In a later section of this chapter, when the results from the manual evaluations are assessed, a comparison will be made of the results with and without the penalties discussed above.

4.3.3 MANUAL RESULTS ACCORDING TO WCAG POUR PRINCIPLES

Figure 4-4, below, confirms that the majority of errors occurred in the perceivable principle; this needs to be balanced against the number of success criteria contained in each of the four listed in Table 4-5.

Principle	Level A	Level AA	% of total
Perceivable	8	6	36.84
Operable	9	3	31.58
Understandable	5	5	26.32
Robust	2	0	5.26
Totals	24	14	100%

Table 4-5: POUR principles without AA Success Criteria

As Shown in Table 4-5, the understandable and robust principles contain the fewest guidelines. Perceivable has fourteen guidelines or 36.84% of the total, operable has twelve guidelines or 31.58%, understandable has ten guidelines or 26.32%, and robust has two guidelines or 5.26%. However, as the errors were aggregated according to principle, it was observed that the most violations occurred within the perceivable principle. The distribution of A and AA criteria amongst each principle is provided in Table 4-5 above.

In order to determine if there was a relationship between the scores of the POUR principles for each of the manual evaluations conducted, they were compared using the Wilcoxon Signed Ranks test.

Table 4-6: Wilcoxon Signed Ranks Test for POUR Principles for Evaluation #1 and #2

Test Statistics^a

	Perceivable Run 2 - Perceivable Run 1	Operable Run 2 - Operable Run 1	Understandable Run 2 - Understandable Run 1	Robust Run 2 - Robust Run 1
Z	-3.047 ^b	-2.605 ^b	-1.000 ^c	-1.727 ^b
Asymp. Sig. (2-tailed)	.002	.009	.317	.084

a. Wilcoxon Signed Ranks Test

b. Based on negative ranks.

c. Based on positive ranks.

A Wilcoxon matched pairs signed rank test is used to determine whether there is a difference in the accumulated scores (Laerd Statistics; Northern Arizona University; Oswego State University of New York) between two periodical tests of the perceivable, operable, understandable and robust principles separately. This nonparametric test is conducted when the data is not normalised. Results of these analyses indicate, in Table 4-6, significant differences between the first and the second evaluations of the perceivable and operable principles, $z = -3.047$, $p < .05$ and $z = -2.605$, $p < .05$ respectively. However, there are no significant differences between the first and the second evaluations of the understandable and robust principles, $z = -1.000$, $p > .05$ and $z = -1.727$, $p > .05$ respectively. The implications of the result are shown graphically in Figure 4-4.

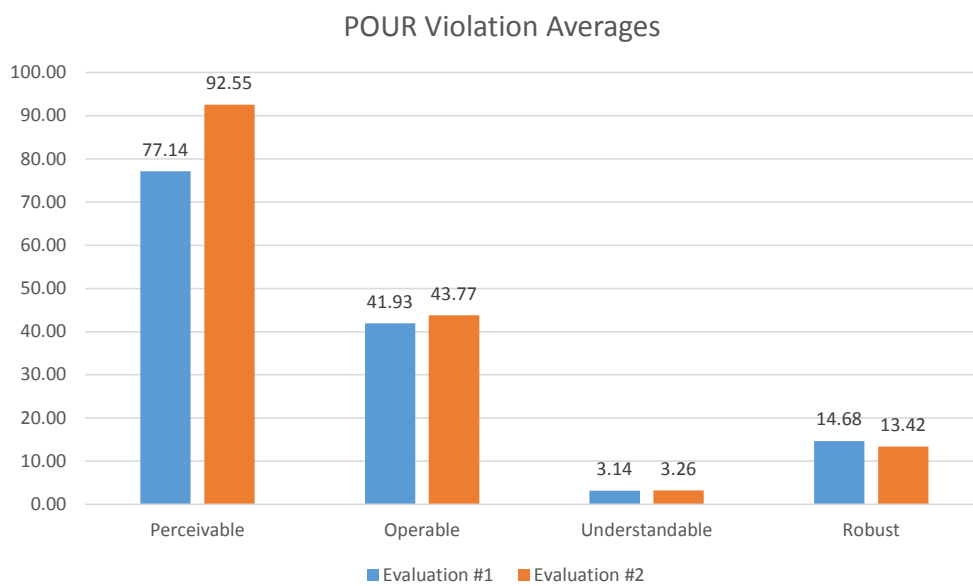


Figure 4-4: POUR Violation Averages

The results were summarised to show the dispersion across the four POUR principles. Figure 4-4 illustrates the uneven distribution of violations, with the majority of violations occurring in the perceivable and operable principles, even though larger percentages of the success criteria are located under these two principles.

Although Table 4-5 demonstrates that the perceivable principle comprises 36.84% of WCAG 2.0 success criteria, 56.35% of the overall violations in Evaluation #1, and 59.93% in Evaluation #2, were found to have occurred under this principle. For the operable principle, 31.58% of the success criteria are located under this principle, yet it accounted for 41.93% and 43.77% of the violations for Evaluation #1 and Evaluation #2, respectively. 5.26% of the success criteria are located in the robust principle, yet it accounted for 14.68% and 13.42% of the violations for Evaluation #1 and #2, respectively. The reverse was true, however, for the understandable principle, which has 26.32% of the success criteria, yet only accounted for 3.14% and 3.26% of the Evaluation #1 and Evaluation #2 violations, respectively.

In Table 4-9 the POUR principle errors for all categories are shown, with and without penalties. While the corporate websites were still the worst performers in Evaluation #2, the Federal government websites remained as the best. However, the gap between the corporate and the not-for-profit websites became smaller. The corporate websites did indeed deteriorate, as did the federal government, government-affiliated, local government and not-for-profit websites, with only the state government sites improving marginally.

The following section breaks down the results of the manual expert evaluation by category: federal, state, local government, government-affiliated, not-for-profit, and corporate. In this way, it is possible to see, in answer to Supporting Question #1, whether the type of website influences scores for the accessibility of the website.

4.3.4 MANUAL TESTING BY CATEGORY

In Chapter 3, the researcher provided a description of the websites included in the target sample and the rationale for their selection. In this section, a detailed analysis of the results for the different categories is provided, the full data tables of results being provided in Appendixes 4-1 to 4-8.

The list of 138 websites selected for review was broken down into categories which are shown in Table 4-7, as both the number of websites in each category and as the percentage of the total that category comprises. The government-affiliated websites are amalgamated into the overall government category due to the fact they receive some form of government funding and are answerable to one of the government levels.

Table 4-7: Number and percentages of websites in sample

Category	# of websites	% of total
----------	---------------	------------

Federal government	17	12.32
State government: 6 from each of 7 states or territories	42	30.43
Local government, 2 from each state.	12	8.70
Government-affiliated: 3 utility companies, 7 universities	10	7.25
Not-for-profit	9	6.52
Corporate: 6 tourism, 8 services, 8 of Australia's largest corporations including banks, retail, and mining, 8 public transportation, 2 airlines, 4 taxi, 5 connectivity – phone and internet, 7 media – newspaper, television and online.	48	34.78
Total	138	100%

Table 4-7 demonstrates that the government websites account for 81 or 58.7% of the target sample, while the non-government sites, consisting of the not-for-profit and corporate websites, totals fifty-seven websites, or 41.3% of the target sample.

4.3.4.1 OVERALL RESULTS OF EVALUATION #1 AND EVALUATION #2

In the manual expert testing, two evaluations were conducted, Evaluation #1 and Evaluation #2. The time period between evaluations varied from twelve to eighteen months due to the time it took to work through the evaluations of five pages for each of 138 websites. Part of the rationale for testing the websites twice was to see if there was either an improvement or deterioration in the accessibility of the websites and also to validate the testing. In Evaluation #2, the researcher was able to view the results from Evaluation #1, reviewing each violation to determine whether it still existed and if new violations had been added. While it might be assumed that improvement demonstrated that the website developer was working on correcting particular types of violations, such as the provision of PDF without an accessible alternative, providing captions for videos, etc., this was not verifiable. A number of reasons might account for improvements, including the addition or removal of content, redevelopment of the website, or the solution of accessibility issues.

In Table 4-8, the mean for each of the categories is provided for Evaluation #1 and Evaluation #2. An increase in the mean score for the category between the evaluations, shown as a positive number in the difference of mean, indicates that there was an increase in the aggregated number of accessibility violations for the

websites in that category. Correspondingly, a decrease in the number of accessibility violations is shown as a negative number in the difference of mean column.

Table 4-8: Mean results for Evaluation #1 and #2 by Category

Category	Evaluation #1			Evaluation #2			Difference of Mean
	Rank	Mean (\bar{x})	SD	Rank	Mean (\bar{x})	SD	
Federal Gov.	1	22.93	19.54	1	23.61	22.31	-0.69
State Gov.	4	27.79	15.64	4	27.44	14.19	0.35
Local Gov.	2	24.40	9.84	3	24.93	11.16	-0.53
Gov. Affiliated	2	24.40	13.78	2	23.94	11.68	0.46
Not-for-profit	5	41.73	31.44	5	47.49	32.78	-5.76
Corporate	6	56.88	112.48	6	64.35	-7.47	-7.47

Table 4-8 demonstrates the relative placing of the different categories of websites studied. All categories retained their rankings between Evaluation #1 and Evaluation #2, except the local government websites. They started at an equal ranking with the government-affiliated category, but deteriorated slightly, resulting in a ranking fall to third. By categorising the websites according to federal government, state or territory government, local government, government-affiliated, not-for-profit, and corporate, there was the opportunity to observe changes in the accessibility of the websites individually and by category. It is evident that the corporate and not-for-profit websites' accessibility deteriorated from the first evaluation to the second.

Although the overall accessibility of the federal government websites decreased slightly between the two evaluations, they were still the most accessible of the categories in both. The federal government websites displayed the least number of accessibility violations, followed by the government-affiliated category. Overall, there was little change from Evaluation #1 to Evaluation #2, except for the two worst performing categories: corporate and not-for-profit. The other categories showed little change between evaluations and even between categories. The corporate sector and the not-for-profit each demonstrated an increase in accessibility violations in Evaluation #2. This is illustrated in Table 4-8, which summarises the sector changes.

There was not a significant margin between any of the government (mean difference= -0.69 to 0.35) or government-associated agencies (mean difference=0.46). Interestingly, most websites had approximately the same number of violations between Evaluation #1 and Evaluation #2, while the not-for-profit (mean difference=-5.76) and corporate categories (mean difference=-7.47) had a noticeable increase in accessibility violations in the second evaluation. Individual websites either performing much better than the average in their category, or much worse, affected the score of the category as a whole. For example, when the federal

government websites were analysed, two of the websites displayed significantly more violations than the others, thus making the category's score worse than if all the websites were equally accessible.

In a preceding section of this chapter, the penalty system was incorporated to assist in determining the impact of particular errors. This penalty system applied a five point penalty, instead of the one point per violation used for all other accessibility violations, for every critical WCAG error and for every use of a PDF document without an accessible alternative. For the purpose of comparison, the mean of the accessibility violations was used in this analysis rather than the actual number of violations.

Table 4-9: Manual Evaluation #1 and #2 Rank by Categories with and without penalties

Category	Evaluation #1		Evaluation #2					
	Mean with penalties	Rank	Mean without penalties	Rank	Mean with penalties	rank	Mean without penalties	rank
Federal Gov.	21.6	1	17.5	1	22.2	1	19.9	1
State Gov.	28.4	3	23.4	4	28.1	4	22.9	4
Local Gov.	24.4	2	20.5	2	25	3	20.9	2
Gov. Affiliates	24.4	2	22.3	3	23.9	2	21.7	3
Not-for-profit	41.7	4	40	6	47.5	5	43.7	6
Corporate	56.9	5	34.6	5	64.3	6	43.5	5

Table 4-9 demonstrates the minimal change in rank between evaluations when the penalties for critical WCAG errors and use of unsupported technologies, PDF files without alternative, are removed. The federal government websites had the lowest mean, with or without the penalty imposition in Evaluations #1 and #2. The corporate websites had the highest mean in both evaluations when the penalties were considered. However, when the penalties were removed, the mean for the not-for-profit category was slightly higher than that of the corporate websites, reversing their rankings.

It is important to note that the size of the website did not play any part in the manual assessment as it was calculated on five pages from each website with the same functionality, or as nearly as possible, and then averaged. Therefore neither the larger or smaller websites were disadvantaged in the analysis. The federal government websites ranked first with a mean of 21.6 with penalties and 17.5 without penalties in Evaluation #1, which contrasts sharply with the lowest-scoring category of the corporate websites which had a mean of 56.9 with penalties and 34.6 without penalties. The ranked positions for the categories remained the same after Evaluation #2. In fact, the corporate category had approximately twice as many penalty points as any of

the government categories, whether or not penalties were included in Evaluation #1 and this gap only widened in Evaluation #2.

Whether or not the penalties are considered, there is little appreciable difference in scores between the federal government, government-affiliated and local government categories, with state government having slightly more violations. Both the corporate and the not-for-profit categories had similar starting violation counts, but were significantly higher than the other groups. The most noticeable change when the penalty violations were removed is that the score for the not-for-profit sites echoed that of the corporate websites. This suggests that considering critical WCAG errors and the use of PDF documents without more accessible alternatives had a greater negative impact on the overall score for the not-for-profit websites than any other group. This could be ascribed to a number of factors, including a lack of understanding of the most critical accessibility guidelines or of the importance of providing alternatives for PDF documents. However, as not-for-profit websites do not fall within the Australian government website group, it is understandable that this knowledge is not necessarily shared by this category of website owners. The Australian Government provided information to organisations which fell within its jurisdiction. This information was then passed down to State or Territory governments to disseminate within their member agencies. There is no evidence to suggest that the not-for-profit or corporate sectors were provided with information about the NTS or were advised about the provisions of the Australian Human Rights Commission's *Disability Discrimination Notes* (Australian Human Rights Commission, 2010). At present, it is also not known how well the information provided by the NTS has been communicated to local government and government-affiliated agencies, as each state and territory is responsible for local government within its jurisdiction.

The preceding discussion relates to overall results for the manual evaluations. In the following sections, the results are presented for the manual evaluations of each individual category: federal government, state government, local government, government-affiliated, not-for-profit and corporate. Chapter 6 provides a discussion of the significance of the results and considers the critical importance of the methods used for evaluation.

4.3.4.2 FEDERAL GOVERNMENT MANUAL EVALUATIONS

Upon first examination, the federal government manual website evaluations showed a slight decrease in accessibility between Evaluation #1 and Evaluation #2, as shown in Tables 4-8 and 4-9 and more fully in Appendix 4-1. In other words, between Evaluation #1 and Evaluation #2, the mean increased by 0.69 to a mean of 22.2 violations per page. This means that, in the manual evaluation of the scores of the federal government websites, the overall accessibility of the websites as demonstrated by the five representative pages deteriorated slightly compared to the corporate websites. There was a mean difference of 7.47 over the same period within the same category of web pages. In Table 4-8, the mean was provided for both Evaluation

#1 and Evaluation #2, with and without penalties imposed. There is a decrease in the mean when penalties are removed but, as mentioned earlier, this does not produce a discernible change in the rankings of the websites. However, there was an overall decrease in the mean violations for the entire research sample.

To break this down further, an examination of a selection of the websites in the federal government category shows which websites had the highest number of accessibility violations. The category mean in Table 4-9 for Evaluation #1 demonstrates that with penalties (\bar{x} =21.6) and without penalties (\bar{x} =22.2) the federal government was the best-performing in both evaluations. However, the results would have been even better if all websites had performed equally well. Websites FD1, 10 and 14 had the highest violation counts, while FD15 demonstrated considerable improvement.

Table 4-10: Manual Evaluations - Federal Government - Most Violations

Website	Evaluation #1		Evaluation #2	
	Mean with penalties	Mean without penalties	Mean with penalties	Mean without penalties
FD1	62	51	73	51
FD10	37.6	37.6	48	48
FD14	70.2	53.2	73.8	62.8
FD15	36.6	10.6	18.2	13.2

Data extrapolated from Appendix 4-1 demonstrates that websites FD1, FD10 and FD14 had the highest rates of mean accessibility violations across the five pages evaluated. However, overall, there were no extreme increases in violations between Evaluations #1 and 2. It is interesting that FD15 had a large reduction in the category “reliance on unsupported technologies”. This related to the use of PDF documents without the provision of a more accessible alternative. It would seem that this agency had been working either on removing PDF files or adding an accessible alternative. Also of note, FD4 and FD12 had minimal accessibility violations, which decreased even further between Evaluations #1 and #2 (see Appendix 4-1). Additional analysis presented in this chapter provides further insights into the nature of these violations.

Although the mean for the complete sample decreased, with and without penalties, between manual Evaluations #1 and #2, this is not true for the corporate category when it is separated from the other categories, as can be seen in Table 4-10. Results for the corporate category are examined later in this chapter.

Individual accessibility scores differed dramatically from one website to another, with FD12 scoring 61.54% fewer violations, and FD6 scoring 24.39% more violations, over the same period. It should also be noted that one of the websites was assessed after the data collection period ended. Its violations had been reduced to the point that it was almost entirely *WCAG 2.0* AA compliant. This success was due to the host organisation migrating to a completely new website. However, as the change was completed after the data collection cut-off point, the improvements were not included in the scoring. This example demonstrates the fluid nature of websites. A website may change from being *WCAG 2.0* AA compliant one day to non-compliant the next if new content is inserted. Percentage changes appear to be more dramatic with higher numbers of errors. For example, FD1 had an increase in violations of 17.74% and FD10 had violations which increased by 27.66%. Websites FD4 and FD12 had very low violation scores at the beginning of the data collection and improved over time, reducing their scores by 52.63% and 61.54% respectively. However, as it means that FD4 reduced its average violation score from 3.8 per page to 1.8 per page, and FD12 reduced its from 7.8 to 3.0 per page, it appears less impressive because of the low initial scores.

It is necessary to break down the manual evaluation scores still further into the POUR categories of *WCAG 2.0* to see where the overall accessibility violations occurred most frequently. When the POUR principles are broken down into their components of perceivable, operable, understandable and robust for the Federal Government websites only seven of the sixteen federal government websites demonstrated a reduction in the perceivable principle violations. The sum of violations across the five pages increased from 128 to 168 for website FD10, while FD14 showed a significant increase in violations from 101 to 143.

Considering the operable violations, FD4 and FD12 continued to trend towards improvement, with FD4 decreasing from nine violations to two and FD12 decreasing from twenty four to three, across all five pages. FD14 had high levels of errors in Evaluations #1 and #2, with 145 and 148 respectively. However, in this category, FD1 began with a high level of violations in Evaluation #1 which worsened in Evaluation #2. Looking at the analysis for FD1 more closely, it appeared that these errors were mainly concentrated on one particular page and related to 81 empty links, with no text or image with alternative text, which a screen reader read as "link." Analysis of FD14 shows that in both evaluations there was a problem with keyboard-only access to controls and a lack of ability to navigate through the website by only using the keyboard. Other problems, such as the use of JavaScript as a link, contributed to the lack of keyboard navigability. On one of the pages in this website new windows opened automatically without the user's knowledge, meaning that the keyboard-only or screen-reader user could not then get back to the originating page without closing the website and starting again. This is a violation of success criteria 2.2.1 (Keyboard) and 3.2.5 (Change on request). This was found to be a common problem, with new windows opening without request or when playing a video where the user is unable to close the video and return to the originating page.

It is notable that, unlike the other WCAG principles, the understandable violations demonstrated little change between Evaluations #1 and #2 for most of the websites evaluated. While some of the websites had zero or one error in this category, websites FD7, FD14 and, to a lesser degree, FD3, FD8 and FD10 had multiple violations that were not corrected between the evaluations. The main problem in this category, with FD7, was the use of select lists with ONCHANGE handlers which fired as the user moved the selection up and down which resulted in a change of context without the user's request. This was often seen when a website with keyboard-only control was tested. While the pointer-specific control, usually a mouse, enables the user to open a selection list to see choices, when the keyboard controller tries to enter the list to see the contents, it acts as if they have clicked on a specific item to request it. Best practice suggests allowing the user to confirm they wish to proceed, usually with a "submit" button.

The final principle, robust, deals with ways in which content may be interpreted by different user agents, including assistive technologies. Two particular items in this principle create issues for website developers: parsing, or mark-up language validation, and name/role/value where the user is not informed of the relationship between the form field and the label for that form field.

The example in Figure 4-5 demonstrates one of the possible methods for providing an explicit label that links the form field to the label.(W3C, 2012d)

The text field in the example below has the explicit label of "First name:". The label element's for attribute matches the id attribute of the input element.

```
Example Code:  
<label for="firstname">First name:</label>  
<input type="text" name="firstname" id="firstname" />
```

Figure 4-5: Code example for method to associate form field with label

This is only one of the possible methods for satisfying this criterion. Other possible solutions include making sure frame and iFrame elements have a title. It is also acceptable to use the title attribute to identify the form controls when the label element cannot be used, usually the case in the search field. However, accessibility advocates generally advise avoiding reliance on the title attribute as it is only usually available for mouse users and sighted users. This may improve when, and if, more assistive technology products provide access to the information in the title attribute.

It is notable that ten of the sixteen websites showed an increase in violations in the robust category. As the parsing, mark-up language validation, was scored as either 0 for no violations or 1 if violations were present, the errors all fall in the name/role/value criterion, WCAG 4.1.2. Principally the errors were related to the lack of labels or incorrect association of labels and the form fields which they are set to describe to the user. As the majority of the "contact us" pages included a form, this was often where this type of violation occurred.

However, forms were found on numerous other pages throughout the sample. Only three websites actually showed an improvement in this category, which indicates that websites developers are not working on, or are unaware of, problems with this criterion. Moreover, violations in the association of controls poses a real problem for the user of assistive technology. For example, if screen reader users do not know to what the form field is relating, they are unable to complete the form correctly, which in effect makes that form inaccessible for them. Forms play a critical role in websites as users need to search for information, register their interests, subscribe to content, retrieve personal details or contact the owner if they are having trouble with any aspect of the website. Having inaccessible forms means that the user needs to telephone or attend the business or agency personally or obtain assistance from another individual to complete the form.

As demonstrated previously in Table 4-9, overall the federal government website violations increased slightly in Evaluation #2. However, the federal government websites still out-performed the other categories by having the lowest number of accessibility violations in each assessment.

The rankings did not change appreciably when penalties were removed as demonstrated in Table 4-11. It can be assumed from the data collected that the websites which had higher penalty counts also had high overall violations. The penalty imposition was used to determine what, if any, role the critical violations and perceived lack of accessibility of PDF documents played in the overall accessibility of a website. Being able to review the results with and without the penalties, the researcher was able to observe whether the score for a website with higher than average counts of either criteria was related to the WCAG POUR criteria and the overall accessibility of the website. It was also possible to observe whether organisations with large numbers of critical violations, or large numbers of PDF without accessible alternatives, were overall the worst-performing in the manual evaluations, indicating an underlying lack of understanding of accessibility principles.

Table 4-11: Comparison of Rankings for Federal Websites

Category	Rank 1 with penalties	Rank 1 without penalties	Rank 2 with penalties	Rank 2 without penalties
FD1	126	118	126	122
FD2	14	18	14	17
FD3	14	14	13	15
FD4	3	2	2	1
FD5	53	41	25	13
FD6	27	41	38	52
FD7	29	37	33	43
FD8	36	31	30	28
FD9	7	7	9	11
FD10	95	107	108	116
FD11	8	9	7	8
FD12	6	8	3	2
FD13	69	66	84	85
FD14	127	127	127	129
FD15	92	15	29	18
FD16	11	4	12	9

Table 4-11 shows that the obvious exception is FD15, which ranked 92nd in the first manual evaluation results when applying the POUR principles, but improved in ranking to 15th when penalties were removed. Upon further examination, this result was validated by the fact that in Evaluation #2, FD15's ranking with penalties had improved to 29th with penalties and 18th upon removal of the penalties. The penalties were related to the use of PDF documents without providing an accessible alternative, something which had been rectified between the two evaluations. Appendix 4-3 provides a ranking of all the websites for Evaluations #1 and #2.

4.3.4.3 CORPORATE WEBSITES

In the manual evaluations, the corporate websites showed an overall deterioration. It should be noted that one of the websites in the corporate sector was significantly responsible for the result. COR27 displayed an increase in violations of 1438.67%, which related to large numbers of PDF files without the provision of accessible alternatives. COR5 displayed a 821% increase in violations, with the Evaluation #1, including penalties, showing an average of 40 errors per page and Evaluation #2 showing 368.2 errors. The difference was due to the addition of a number of images without alternative text, a problem which did not occur during Evaluation #1.

The table in Appendix 4-4 provides all the data for the manual evaluations for the corporate category. Very few websites displayed any decrease in violation scores between evaluations. A positive increase is an increase in the violations, again meaning a deterioration of the accessibility of the websites. Only two of the websites show any significant improvement in their violations rate.

Excluding the two obvious outliers, COR5 and COR27, it is possible to observe more readily the distribution of corporate websites which demonstrate improvement and deterioration. It can be seen that, even discounting the obvious outliers, the majority of corporate websites increased in their numbers of accessibility violations.

The distortion in the data is evident in the outlier COR5, which shows a massive increase in errors in the perceivable category. Only seven websites in this category showed improvements and six remained the same between Evaluations #1 and #2. Overall, 35 of the websites showed evidence of more perceivable violations between the two manual evaluations.

The operability principle shows a pronounced deterioration, with twenty-nine of the thirty-five websites showing an increase in violations between Evaluations #1 and #2. While the perceivable principle is concerned with presenting information to users in ways which may easily be perceived, such as alternatives for non-textual content, operable is concerned with user interface components and navigation. Again, there is one significant outlier in the data collected, that for COR36, which recorded 243 violations in this category in Evaluation #1. Its score was reduced to 96 in Evaluation #2. The errors in this case related to links that did not contain either text or an image with alternative text and to the use of pointer-specific, usually mouse handlers, without equivalent keyboard handlers or controls. The errors in this case were spread throughout the five pages but page 3, selected for images, displayed a higher concentration of violations. The pointer-specific use was drastically reduced prior to the second manual evaluation which resulted in an improved overall score for this website.

The understandable principle relates to how easy it is for users to understand both the information on the page and the user interface. Items in this section include, among others, whether the language is specified for

the page, how errors are handled, whether the context is changed without the user's knowledge and the consistency of navigation and the identification of components.

Three of the websites, COR9, COR23, and COR33, displayed unusually high violation counts in the understandable principle criteria. However, what is most interesting is that, similarly to the federal government websites, few of these websites showed any significant change between the two manual evaluations. Each of evaluations was conducted by fully checking the page against *WCAG 2.0* criteria. This included a review of initial results and the noting of any changes. Where the results of the first review were questionable, results were checked. It could be assumed that website owners, having decided upon a method for design, have not made appreciable changes during the data collection period. Some of the websites showed no errors at all in these categories, which is different from the previous two principles. The error counts are not high in the understandable principle, but the website with the highest negative count used techniques which caused events to occur without users' requests or approval. The data was reviewed manually to ensure that the lack of changes was not due to data collection errors. Some of the websites did demonstrate some degrees of change, but this phenomenon was observed in most of the categories.

The final principle, robust, deals with how the content may be interpreted by different user agents, including assistive technology. Two particular items in this principle created issues for website developers: parsing or mark-up language validation, and name/role/value. The latter violation occurs when the user is not informed of the relationship between the form field and the label for that form field. For example, COR1 had a disproportionately large number of violations which decreased very slightly between the two evaluations. Upon examination of the evaluations, it was noted that these violations related to the use of form fields with no, or incorrectly associated, labels for the form fields. In this case, a screen reader user would have heard "edit blank" for each form field presented, thereby not understanding the purpose of the field. Of the thirty-eight websites in the corporate category, 22 had an increase in accessibility violations in this category, and 14 remained the same. This indicates that very little attention is being paid to correction of these errors. It is important to note that not every parsing error is classed as a *WCAG 2.0* error. The parsing errors that cause problems for users and hence are classed as *WCAG 2.0* errors are those that:

- Contain duplicate attributes,
- Do not have complete start and end tags,
- Are not nested according to their specifications, and
- Have non-unique ID values, except where these are allowed by the specifications.

Errors that fall in the above four points are considered *WCAG 2.0* errors under 4.1.1 which is an A level error. In the interest of consistency, each website received either a 0 for no parsing errors or a 1 for any parsing errors, even if the error count was sometimes into the thousands. Therefore, for the websites that displayed

high numbers of errors in this robust principle, the result would be from multiple errors in 4.1.2 Name/role/value or, most commonly, incorrectly associated controls.

The use of PDF files without provision of an accessible alternative is shown in Figure 4-6.

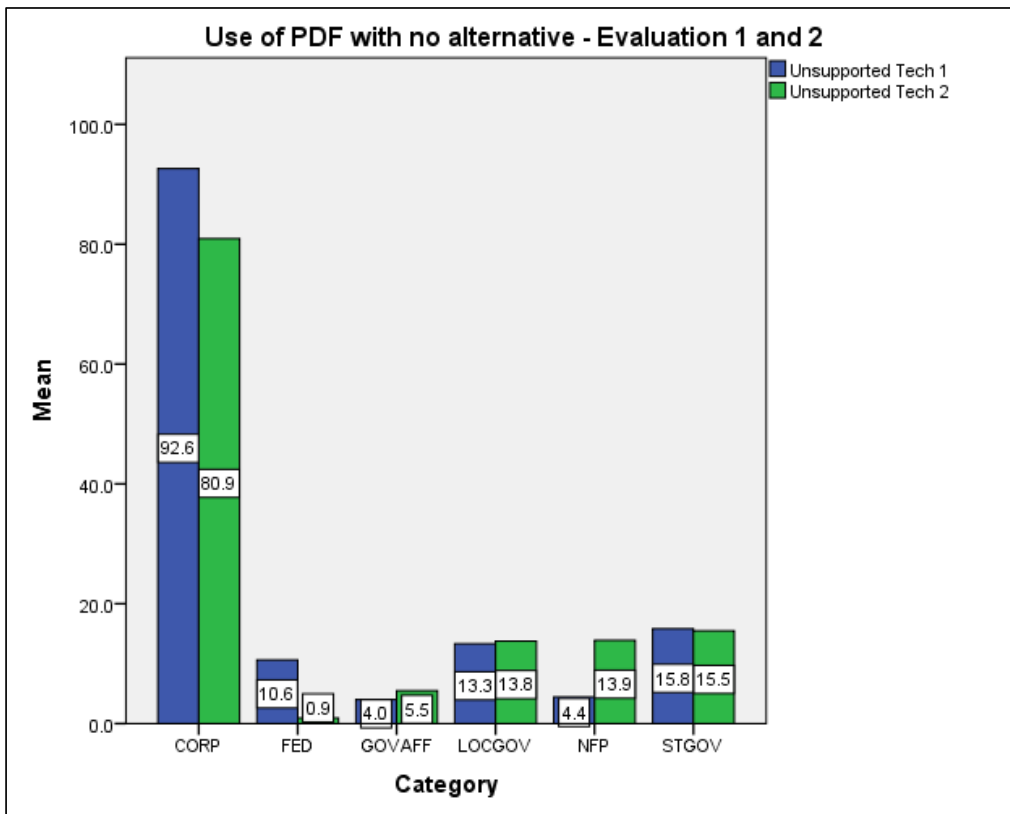


Figure 4-6: Use of PDF with no alternative - Evaluations #1 and 2

Figure 4-6 shows that the corporate category had a far higher than average use of PDF documents without the provision of a more accessible alternative. This large discrepancy is largely due to website COR27, which had 3805 penalty points in the Evaluation #1 and 3220 in Evaluation #2. This may be viewed in context with the other websites in Appendix 4-13. As five penalty points were allotted for each PDF without an alternative, these totals translate into 761 PDF in the Evaluation #1 and 644 in Evaluation #2. Eliminating the website COR27 from the corporate category for its spectacular failure to meet the criterion of not having unsupported technology, i.e. PDF files, permits the display of a more normal distribution of data in Figure 4-7.

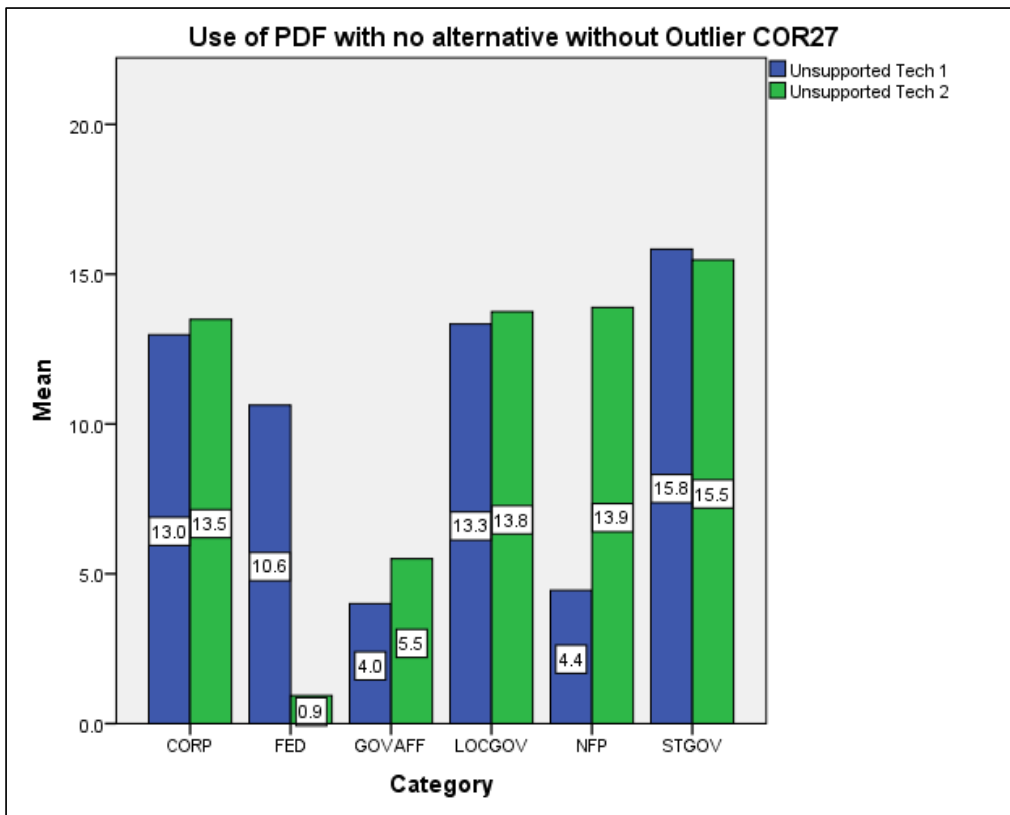


Figure 4-7: Statistics discounting outlier COR27

However, while this elimination appears to bring the corporate category more into line with the other websites, it is not completely realistic. It assumes that COR27 did not display any problems and that there were no websites from the other categories which also had higher than average PDF numbers without accessible alternatives. Figures 4-6 and 4-7 are presented with and without this particular sample simply to indicate the massive impact one very bad site can have on the normal distribution of data.

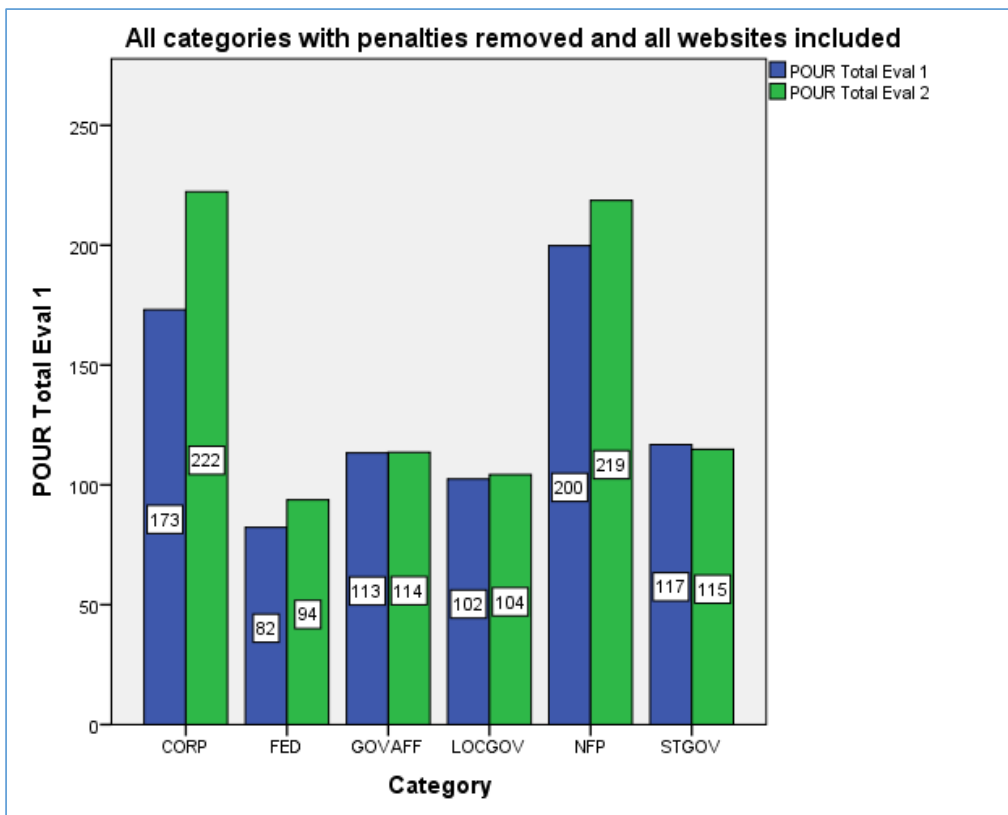


Figure 4-8: All categories with penalties removed and all websites included

The best performing website of the corporate category was COR13, which ranked first with and without penalty imposition. This website had an mean score across the five pages assessed of 5.0 in Evaluations #1 and #2 and, when penalties were removed, 5.6 in Evaluation #1, improving to 5.0 in Evaluation #2. This indicates that not only was the organisation “accessibility-aware” with regard to WCAG 2.0 violations, but was also aware of problems caused by reliance on PDF documents. COR13 contrasted with COR36, which ranked lowest in the category in Evaluation #2 with penalties, improving slightly to forty-second when penalties were removed. COR36 had a mean violation count in Evaluation #1 of 108.2, which improved slightly to 99.2 in Evaluation #2. The results for COR36 relate chiefly to violations in the perceivable principle rather than to the penalty imposition.

The results above reflect the manual Evaluations #1 and #2 for the corporate category. This category, together with the not-for-profit category, made up the non-government sector of this research. The following section will present the results for the state government category.

4.3.4.4 STATE GOVERNMENT CATEGORY

While the *NTS* pertains primarily to federal government websites, it did state that states and territories had the option to follow the same timeline or adhere to their own timelines.

WCAG 2.0 Compliance targets

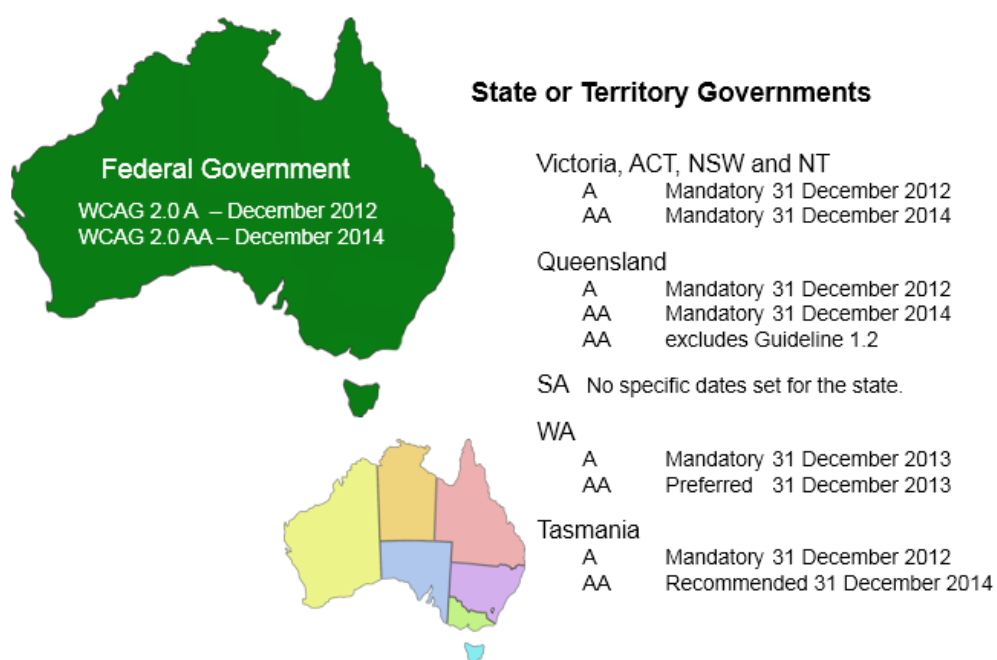


Figure 4-9: WCAG Compliance Targets for Federal, State and Territory Governments

The data depicted in Figure 4-9 was obtained from information published by Media Access Australia (Zugang für alle, 2009). As shown in this figure, most of the states adopted the same timelines as those of the federal government. Western Australia chose to require compliance only with Level A as mandatory, but stated that Level AA was the preferred compliance level. During this study, it was not possible to locate specific dates for South Australia. Tasmania stated that Level AA was recommended, but not mandatory, by December 2014, and Queensland removed success guideline 1.2, with its associated criteria, from mandated compliance. Success guideline 1.2 principally relates to multimedia content.

For comparison purposes, six websites from each of the six states and the Northern Territory were selected. These websites were selected to reflect the same functionality for each state or territory and included Health, Disability, State Library, Jobs, Emergency Services and Small Business agencies.

Eighteen of the forty-two state or territory government websites revealed increased violations between the two evaluation points. Table 4-12 shows that in both evaluations the state government category ranked fourth out of the six categories with mean violations in the manual assessments of 27.79 and 27.44, decreasing overall by 1.26%. While violations increased in many of the websites in this group, four of the websites improved substantially, creating an overall improvement of 1.26% for the category.

Only Victoria and Western Australia demonstrated an overall decrease in violations between Evaluations #1 and #2 when penalty calculations are included. The same states showed a decrease in violations with an improvement in Queensland’s score, which had a slight increase in violations between the evaluations when penalties are included and a slight decrease in violations when the penalties are removed. This reflects findings in other categories which indicate that websites which had high accessibility counts in the POUR principles also had high counts of critical WCAG violations and many PDF files without accessible alternatives.

Between Evaluation #1 and 2 it was evident that penalty imposition did not change the rankings dramatically. Victoria was the only exception and demonstrated a considerable decrease in violations between the two evaluations. Western Australia’s accessibility violations also decreased but, due to the state’s high overall score, the decrease did not result in a change in ranking between Evaluation #1 and #2. Removing the penalties, as shown in Table 4-13, revealed that the gap between Victoria and Western Australia was less significant.

Table 4-12: State and Territory Governments’ Mean Differences with Penalties Included

Category	Evaluation # 1			Evaluation # 2			Difference of Mean
	Rank	Mean (\bar{x})	SD	Rank	Mean (\bar{x})	SD	
NSW	5	30.73	16.76	6	32.07	20.84	-1.34
NT	3	26.67	9.28	4	27.10	10.04	-0.43
QLD	2	22.23	13.99	1	22.57	14.07	-0.34
SA	4	27.10	12.30	5	27.57	13.09	-0.47
TAS	1	19.93	6.57	2	23.13	4.90	-3.20
VIC	6	32.63	18.88	3	27.00	9.10	5.63
WA	7	39.83	21.03	7	37.20	21.25	2.63

The differences in the rankings of the websites is less significant when the penalties are removed. Other than Victoria, which improved its ranking by two places, as shown in Table 4-12, most of the other states changed by one place at most. The Victorian websites actually dropped in ranking in both Evaluation #1 and #2 when

the penalty imposition was removed. This was due to the low number of PDF documents and critical violation points for these websites. Only one website revealed PDF documents without alternatives, SG36. This website had five occurrences, at five penalty points for each violation, for each of the two evaluations. In the critical violations, two of the websites had one violation in each of the two evaluations; one had none in Evaluation #1 and one in Evaluation #2; while one with one violation in Evaluation #1 increased to two in Evaluation #2. When examining the POUR violations without penalties for individual websites, it was observed that two of the Victorian websites showed substantial increases in the perceivable principle violations, with SG32 increasing from 58 to 83 and SG33 increasing from 32 to 90 violations in these categories. SG31 demonstrated a considerable improvement in the perceivable principle, with its violations decreasing from 197 to 42. Thus the reason the Victorian government category dropped in the rankings when penalties were removed was because they had very few penalty points, as most of their violations occurred in the POUR principles. These results are provided in full in Appendix 4-5.

Table 4-13: State and Territory Government Evaluation #1 and #2 ranking with and without penalties

State	Eval 1 with penalty	Eval 1 without penalty	Eval 2 with penalty	Eval 2 without penalty
NSW	5	3	6	3
NT	3	5	4	4
QLD	2	2	1	1
SA	4	4	5	3
TAS	1	1	2	2
VIC	6	7	3	5
WA	7	6	7	6

It is interesting to consider the sources of penalties and their effect on overall scores. NSW had an extremely high score for unsupported technologies, PDFs without accessible alternatives, which decreased between Evaluations #1 and #2. In Western Australia there was an increase in the use of PDFs without accessible alternatives. Victoria, as mentioned previously, had low numbers of penalty points which meant that when they were removed its ranking actually worsened.

In the Western Australian websites, the use of PDFs without alternatives increased across the group from a mean of 34.4 to 35.8. Likewise the occurrence of critical violations increased from a mean of 10.8 to 12.5.

However they showed slight improvement in both the perceivable (Evaluation #1 = 73.5) and operable (Evaluation #1 \bar{x} =52.5, Evaluation #2 \bar{x} = 40.7) principles.

Table 4-14: State or Territory Government Category: Reliance on Unsupported Technology

State	Unsupported Technology 1	Unsupported Technology 2
NSW	215	175
NT	95	80
QLD	100	110
SA	85	90
TAS	45	65
VIC	25	25
WA	205	215

In all cases, the majority of the penalties occur because of the use of PDF documents without provision of more accessible alternatives. It is a concern that in four of the seven states these violations increased, with only Victoria showing no change, as shown in Table 4-14. The use of PDFs without accessible alternatives decreased in only two of the states. This situation led to the high score for Western Australia when penalty scores were included and also for NSW which rose from a ranking of fifth out of seven with penalties to third when the penalties were removed. Only in Victoria, were the levels of all violations, unsupported technology and critical violations, at a consistently low level. NT demonstrated low levels of critical violations but higher levels of the use of PDF documents with alternatives. The examination of websites in the corporate category demonstrated that this was a problem for those websites also. This problem is seldom addressed outside government circles, due to the NTS and the stance by AGIMO of insisting that websites provide accessible alternatives for PDFs.

Table 4-15: State and Territory Government Category: Critical WCAG Violations

State	Critical Violations Evaluation #1	Critical Violations Evaluation #2
NSW	75	85
NT	15	15
QLD	35	50
SA	65	50
TAS	25	20
VIC	15	25
WA	65	75

Table 4-15 demonstrates that, in NSW, Victoria, Queensland and WA, the critical WCAG errors increased. Such increases are alarming as these types of errors may cause insurmountable accessibility problems for users. Lack of control of audio content, keyboard traps, flashing content and moving content without controls require immediate correction in order for people with disabilities to be able to use Web content, as is stated in the *How to Meet WCAG 2.0* document, “failure to meet them could interfere with any use of the page” (W3C, 2012c).

As in the other categories, the perceivable guideline is the one where the majority of the errors occur, followed by the operable guideline. The uneven distribution of success criteria was discussed in relation to Table 4-2 and the percentage of the total of each. However, in this case, while there are more success criteria under the understandable guideline there was a disproportionately larger number of violations under the robust guideline. Again, as seen with the corporate category, this is due to SC 4.1.2 which relates to the association between controls and, in most cases in this research, form fields and labels not correctly associated. Interestingly, in other categories there are only the smallest differences in the understandable guideline results between evaluations.

Table 4-16: State and Territory Government Category: POUR Mean

State	Perceivable 1	Perceivable 2	Operable 1	Operable 2	Understandable 1	Understandable 2	Robust 1	Robust 2
NSW	45.8	62.2	49	40	1.7	4.5	8.7	10
NT	65.8	70.8	34	32	1.7	1.2	13	16
QLD	46.7	44.7	25	26	0.3	0.7	17	15
SA	53.0	57.3	44	44	3.8	4.7	10	9.3
TAS	51.7	62	22	24	3.2	2.8	11	13
VIC	87.0	65.2	53	47	3.5	2	14	13
WA	79.0	73.5	53	41	3.8	4	19	20

When considering violations under the perceivable principle, Table 4-16 shows that both Victoria and Western Australia decreased their violations in this category. This resulted in Victoria’s rank improving from seventh, with the highest number of violations in the group in Evaluation #1, to fifth for perceivable violations. Unfortunately four of the seven states or territories demonstrated increased violations of the perceivable principle between evaluation. The overall trend of Victoria and Western Australia displaying the most violations was reinforced, but Victoria showed some improvement when compared with Western Australia.

In the operable principle, four of the states showed some improvements or decreases in the number of violations, but there were no dramatically increased violations by any of the states.

From the results for the understandable guideline, it is observed that four of the states increased the number of violations between the evaluations. In particular, NSW increased its violations dramatically which was due mainly to one website increasing from zero to fifteen violations. For this particular website, there were fourteen instances of a problem where hovering over images at the top of the page resulted in changes of context. This problem has been remedied since the data collection phase of the research, but was still present at the time of Evaluation #2. This example illustrates the fluid nature of websites and the need to evaluate components of websites on a continuous cycle, rather than at fixed points in time.

As in some of the other categories, the scores for the robust principle did not show dramatic increases or decreases. Four of the websites increased in the number of violations while three exhibited decreases. This

was mainly due to SC 4.1.2, which relates to the use of form controls without labels or with improperly associated labels, which has been discussed previously in this thesis.

4.3.4.5 LOCAL GOVERNMENT

The research found there was little difference in the overall evaluation scores for the local government category between the two evaluations, whether or not penalties were included. Appendix 4-6, which provides a summary of the manual evaluation results for this category, demonstrates considerable variation in the individual websites with LG9 having considerably higher scores than the other websites.

For most of the websites, the largest source of violations is again in the perceivable principle. The mean result for the perceivable principle ($\bar{x}=58.83$) contrasts negatively with the scores for LG9 in this principle score, 165 in Evaluation #1 and 137 in Evaluation #2, as provided in Table 4-17.

Table 4-17: Mean vs. Results for Case LG9

	P1	P2	O1	O2	U1	U2	R1	R2
Total count for local government	706	723	375	375	40	57	108	97
LG9, number of violations	165	137	17	31	1	21	5	5
% of LG9 impact	23.37	18.95	4.54	8.27	2.50	36.84	4.63	5.15

The highest number of violations again occurred under the perceivable principle, the principle with the most success criteria and which accounted across the whole research group for the greatest number of violations. In the case of LG9, problems were related to more than 100 images without alternative text. Many of these images were maps with embedded images, none of which had alternative text. In the case of LG6, shown in Table 4-17, in Evaluation #2 the research identified numerous instances of the use of JavaScript to emulate a link. A JavaScript emulation looks like a link and acts like a link, but isn't a link. There were also ONCLICK handlers for links in a slideshow. The use of pointer-specific handlers without an equivalent keyboard handler render the feature, such as a slideshow, inaccessible for keyboard or screen-reader users. If there is an equivalent keyboard handler such as ONKEYPRESS the feature may be operated by either mouse or keyboard.

While overall scores for the local government websites were very similar in both manual evaluations, the data shows the perceivable violations actually increased in eight of the twelve websites and remained the same in

two, with only two websites, LG1 AND LG9, showing any improvements. Table 4-18 demonstrates that website LG1’s violations decreased from fifty-three to thirteen, while LG9’s decreased from 165 to 137. The considerable improvement in these two websites made an impact in the overall score for this category.

Table 4-18: Local Government Improvement

	P1	P2	O1	O2	U1	U2	R1	R1
	58.83	60.25	31.25	31.25	3.33	4.75	9.00	8.08
LG1	53	13	63	0	5	0	15	6
LG6	65	70	76	92	5	5	24	9
LG9	165	137	17	31	1	21	5	5

Table 4-18 demonstrates that LG9’s faults decreased considerably in the perceivable principle, but the result was still more than double the mean for this principle across the local government websites.

The results for the local government websites show little similarity to the results for the states in which they are located. For instance, while NSW ranked sixth out of the states, the two local government websites from NSW ranked first and second within the twelve websites in the local government category. Similarly, Tasmania, which ranked second out of the seven websites in the state government category, had two local government websites which ranked seventh and tenth.

In the case of LG1, improvement was demonstrated throughout the success criteria and related to form controls, headings, video captions, and images. It is obvious that considerable attention was given to improving the accessibility of this website, if the perceivable principle is a demonstration of the overall state of the website. LG9 had considerable problems with this principle, which resulted in a disproportionate violation count for perceivable compared to the other principle scores for this particular website.

The scores for understandable in the local government category show a high level of variation with five sites not changing at all and many remaining at exactly the same level. Once again, LG1 showed a high level of improvement, dropping from five to zero violations. LG9 had a dramatic increase in violations, as shown previously in Tables 4-18 and 4-19. LG1’s initial evaluation recorded a missing language declaration on every page which was corrected by the time of Evaluation #2. The poor rating for LG9 relates to the lack of language declaration for foreign languages found on every page. Upon closer examination, it was found that some of the languages had been declared while some had not, which resulted in four violations for each of the five pages.

In the operable principle, as with perceivable, Table 4-18 demonstrates that LG1 has shown considerable improvement by dropping its violations from sixty three to zero. In the first evaluation of LG1 there were found multiple instances of anchor elements without either text or an image with alternative text. Basically, this was an empty link or an image link with no alternative text. This fault had been completely corrected by the time the second evaluation was carried out. In the first evaluation, there had also been numerous links with generic text, such as “more” or “click here,” which were not located within the paragraph, sentence or list. These faults had been corrected before the second evaluation. Compared to the substantial improvements shown by LG1, seven of the twelve websites increased their numbers of violations, although one remained at the same level. However, the results for LG6 show disproportionately high levels in both evaluations, increasing from seventy-six in Evaluation #1 to ninety-two in Evaluation #2.

The local government websites displayed very mixed results in the robust principle. The most obvious changes were the decrease in violations for LG1, but even more obviously for LG6. In Table 4-18, the results highlight LG1 addressing the issue of incorrectly associated form controls and labels before Evaluation #2 and thus improving its score. The improvement in LG6 relates to the same issue of form controls and labels and mainly centres on one of the pages, with the initial results being corrected by the second evaluation.

4.3.4.6 NOT-FOR-PROFIT SECTOR WEBSITES

The not-for-profit sector increased in overall accessibility violations, recorded manually, by 13.79%, which was the largest percentage of deterioration for any of the categories. The summary of the data for the not-for-profit category is provided in Appendix 4-7. The mean violations increased between the first and second evaluations by 13.79%. This may be compared to the corporate sector which, while scoring the highest number of violations, increased by 13.13%. This is evidenced in Figure 4-8 which shows the not-for-profit sector as fifth out of six categories in overall violation numbers. The data shows that there was little change in the relative position of the evaluations, whether or not penalties were imposed. It is reasonable then to assume that the negative rating does not directly relate to the penalty position.

Table 4-19: Manual POUR for Not-for-profit Sector

ID	Perceivable 1	Perceivable 2	Operable 1	Operable 2	Understandable 1	Understandable 2	Robust 1	Robust 2
	130.22	130.11	51.11	71.44	2.67	2.56	15.78	14.56
NFP1	329	318	75	109	3	4	33	37
NFP9	357	346	109	112	5	5	10	10
NFP6	108	103	68	156	1	1	15	15

The negative score for the not-for-profit category is chiefly attributed to websites NFP1 and NFP9, which Table 4-19 demonstrates were highest in the perceivable guideline on both evaluations. Each of them decreased their scores only slightly between evaluations. These two websites had a negative effect on the category scores due to their distance from the mean for almost all principles.

The very high negative score for NFP1 in the perceivable principle relates to images without alternative text and unlabelled buttons, but chiefly to the use of uncaptioned videos. In some cases, there was a reliance on YouTube captioning and, in this case, the captions were unrecognisable from the spoken text. Examination of this website in light of the perceivable guideline shows systemic failure to address accessibility criteria, not only with regard to videos. In the case of NFP9, multiple images without alternative text, many tables used for layout purposes but with a table summary, meant the screen reader was unable to ignore the table structure and would read out the table rows, etc. These operations were not appropriate for a layout table. Best practice suggests that tables should not be used for layout where the designer should instead use CSS for the display. However, if they are used for layout purposes, then there should be no table heading (TH) or table summary attributes to allow the screen reader to ignore reading the table structure. This website had systemic accessibility problems through the perceivable guideline, such as incorrect spacing which results in text all running together when the Cascading Style Sheets (CSS) are turned off. The website has numerous spacer images without setting a null alternative text (alt="") so that the screen reader may ignore the image. This results in the word "image" or its location being read to the user.

In the operable guideline scores, seven out of the nine websites displayed increased violations between the two evaluations, although one stayed the same. Only one of this category displayed decreased violations. This was a matter for concern as the operable principle incorporates keyboard accessibility, timing events and moving content, flashing content, bypass blocks, page titles, link purpose, order of focus, visibility of focus,

multiple ways to locate content, and headings and labels. Table 4-19 shows that NFP9 had numerous pointer-specific handlers without keyboard equivalents, problems which occurred on all five pages. The significant increase in the guidelines for NFP6 related to an increase in the empty links on one particular page, from thirty-four to 108, which considerably affects its score. These violations occur frequently and are either an empty link, with no text, or an image link that does not have alternative text assigned. Links must have either text, or an image that has an alternative text, to pass this guideline. It also requires manual verification to ensure that the link adequately portrays both the destination and description sufficiently to advise the user.

Again in the understandable principle, only two of the websites demonstrated fewer violations in this category, with three remaining the same and two increasing in violations. The lack of change for three of the websites may relate to a website that is not undergoing significant change over time, or mean that there is a lack of awareness of the guidelines and their requirements. However, when looking back through the other principles, there is very little improvement and some deterioration for these websites in any of the other criteria with the scores remaining static for the next principle, robust. Interestingly, two of the websites, NFP 2 and NFP8 demonstrated no violations at all in this principle and some of the lowest levels of violations in the other principles. This might indicate an awareness of accessibility requirements on the part of these organisations.

The scores in the robust principle indicated that six of the nine organisations showed no change at all, with two becoming worse and only one showing improvement. However, it was a considerable improvement for that website.

4.3.4.7 GOVERNMENT-AFFILIATED WEBSITES

Websites classed as government-affiliated included three utility corporations and seven universities. Two of the websites, GA2 and GA7, demonstrated considerably greater than average scores in perceivable in both evaluations. However, both of these websites show an improvement between the evaluations, with GA7 improving considerably more than GA2.

Table 4-20: Government-affiliated POUR

ID	Perceivable 1	Perceivable 2	Operable 1	Operable 2	Understandable 1	Understandable 2	Robust 1	Robust 2
	66.3	61.2	30.6	32.9	3.6	2.5	11	12.1
GA2	154	147	68	63	6	6	33	33
GA7	146	95	16	19	0	0	14	7
GA3	48	44	27	16	11	1	9	4

Table 4-20 demonstrates that the violations in the operable principle are the next highest followed by robust and lastly understandable. The overall average number of errors per page for GA12 decreased slightly between evaluations. With website GA7, however, there was very little overall change between the evaluations, whether or not penalties are included, which would suggest very little change occurred in this website over the study period. Upon further examination, though, the perceivable violations for this website decreased between evaluations. This was balanced by an increase in operable violations.

The data also demonstrates the slight improvement in the perceivable principle for GA2 between evaluations. Five of the ten websites demonstrated a deterioration in this category with the other five showing some degree of improvement, GA7 being the most obvious.

Looking more closely at GA2 for this principle, there are a large number of images, buttons and images of text without alternative text throughout all five pages. One of the pages has 24 form fields with no associated labels. There are duplicate id's, as well as a lack of meaningful sequences and use of absolute sizing which results in problems when the user wants to re-size the text or zoom the whole page to 200%. On most of the pages, the user is not able to make sense of the content if they need to turn off the style sheets, as the links all run together in a block.

In the operable principle, GA2 demonstrates a higher than normal number of violations, although showing a slight improvement between evaluations. Five of the websites show an improvement, while five showing deterioration in this principle.

Upon examining GA2 further, there are numerous links without either text or an image containing alternative text, and pointer-specific handlers without keyboard handlers which makes navigation by keyboard only impossible.

There was a dramatic improvement in the overall results for GA3 as a result of overall website improvement in the understandable principle, rather than any one other issue. The first evaluation demonstrated problems which included JavaScript, which changed the context of the page, the use of drop down select features which did not have labels and did not work properly via the keyboard, all of which were resolved before the second evaluation. It is notable that five of the websites demonstrated no change at all for this principle which is also noted in other categories. The rank for this website improved from seventh of ten to second of ten between Evaluations #1 and #2.

In the robust principle, there was no change in five of the ten websites. The changes that occurred in the other five websites reflected an improvement in SC 4.1.2, which mainly related to the incorrect association of form controls with labels. There was a solid improvement in website GA3 which, upon further examination, revealed it was entirely related to correcting the problems of form and label association.

4.3.4.8 CORRELATION BETWEEN PAGE TYPE AND ACCESSIBILITY

In order to determine if the overall choice of page played a part in the accessibility scores, this study examined the accessibility of the home page for both evaluations. Hackett and Parmanto (2009) discussed the fact that only examining the home page is not a statistically sound method for estimating the overall accessibility of the website (Stephanie Hackett & Parmanto, 2009).

In this research, looking at the overall scores for page 1, the home page, the general trend does not change dramatically from the results shown in the manual evaluations previously discussed. The corporate, followed by the not-for-profit websites, had the highest number of violations with the federal government websites having the least. This might suggest that assessing the home page of a website might give a reliable indication of the overall accessibility of the website. Figure 4-10 again demonstrates that the corporate websites deteriorated the most over the evaluation period.

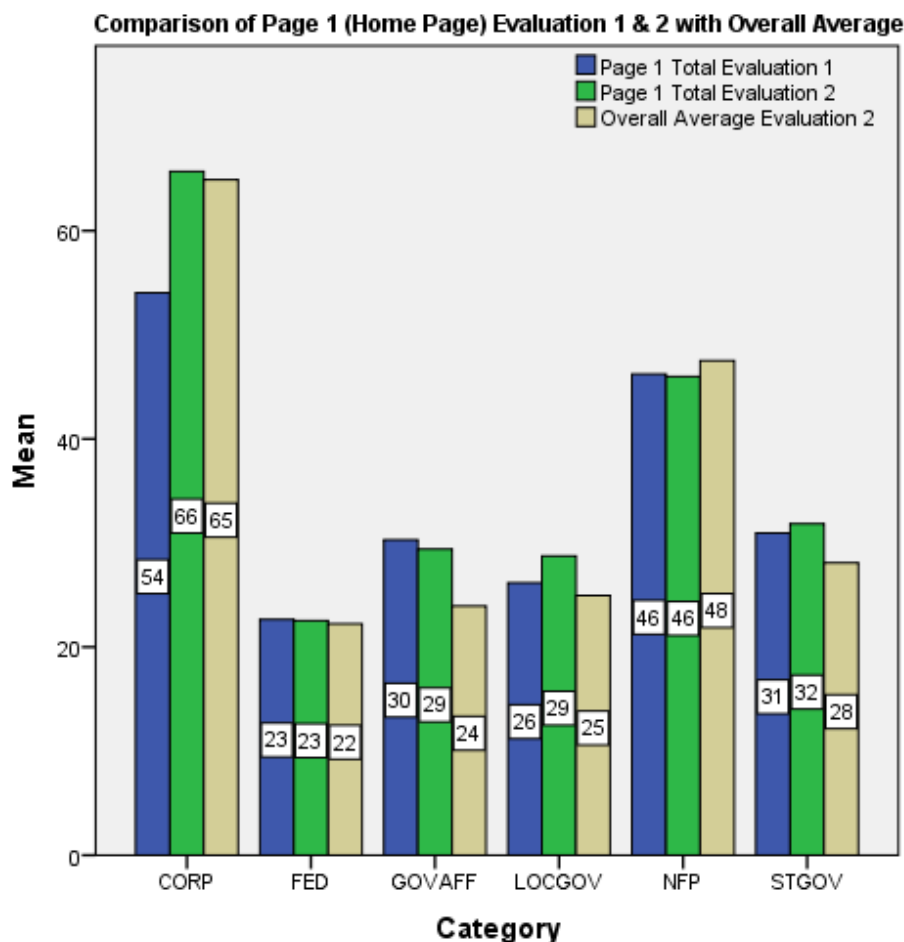


Figure 4-10: Comparison of Page 1, Home Page, with Overall Average

The overall ranking of the categories that has been observed throughout the manual evaluations is further demonstrated in Figure 4-10. This figure shows that the overall status of the categories is largely the same when the home page is used as an indicator of the accessibility of the pages. Particularly for the federal government websites, there is little difference between Evaluation #1 and #2 scores for the home page, page 1, and the overall average of the five pages tested. Figure 4-10 appears to indicate that the more accessible the website, the closer the evaluation of the home page is to the overall accessibility of the website. However, further away from the most accessible category, considering the corporate websites, using the home page as an exemplar of overall accessibility becomes more problematic and less of a predictor of the accessibility of the website.

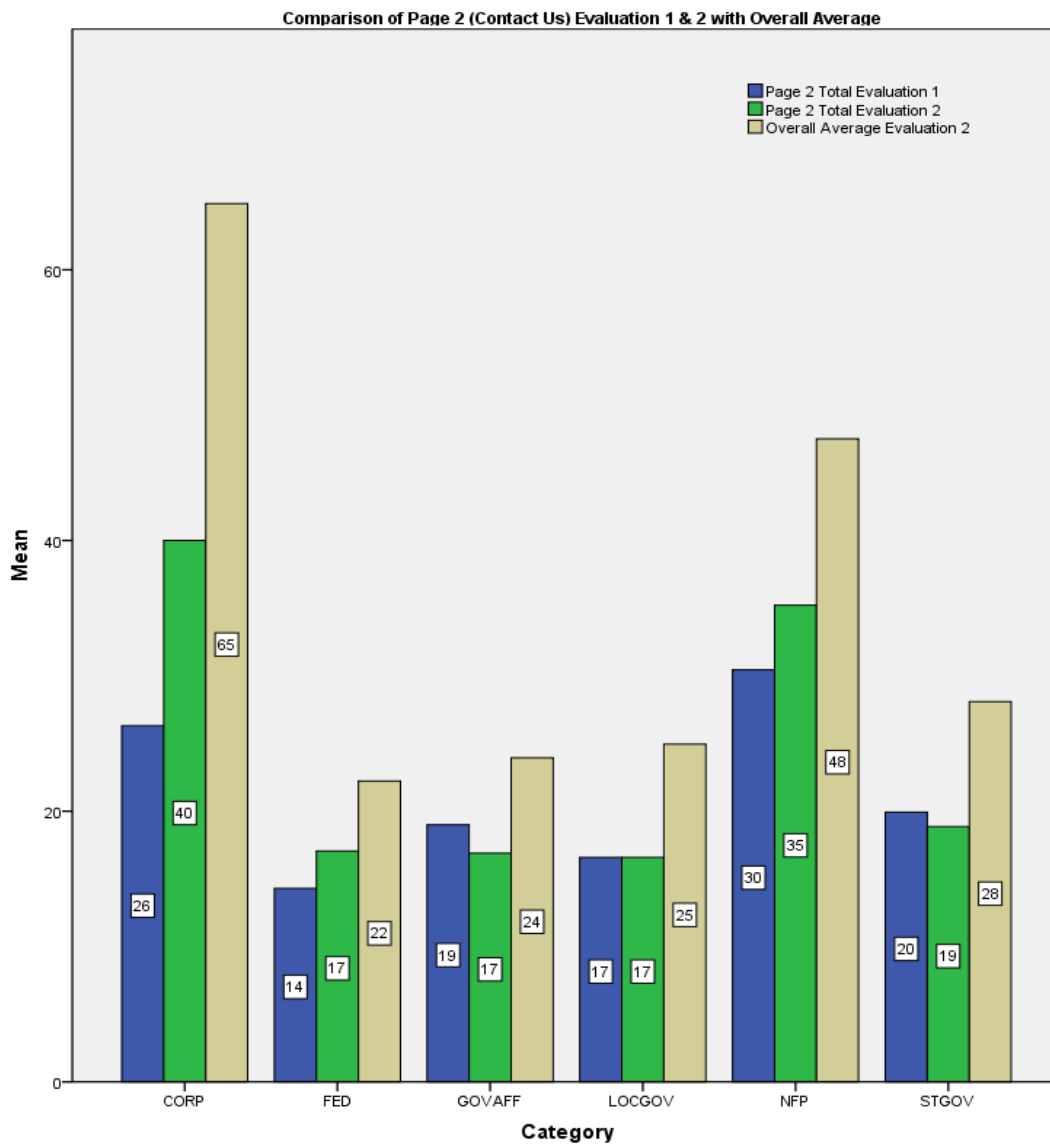


Figure 4-11: Contact Us Page for Evaluations #1 and #2

When looking at the Contact page the same trends in the rating of the categories are obvious, with the corporate and not-for-profit websites the worst-performing categories. Figure 4-11 shows a deterioration in both of these categories between the evaluations. It is also notable that the federal government websites deteriorated somewhat over this period, which would account for some of the slight overall deterioration seen

between evaluations. The local government websites had no changes in the accessibility score for each of the contact pages.

While the Home page results, when compared with the overall average violations across the five pages, showed similarity, the same cannot be said for the Contact Us pages. Figure 4-10 shows that in every category the accessibility violations in Evaluation #1 and #2 were considerably lower than the overall page violations. It could be hypothesised that Contact Us pages generally do not contain complex content, which would make it easier to register low violation counts. Although many of the Contact Us pages contain forms, which are often not accessible, the evaluation results seem to indicate that the content on these pages is not as complex or as difficult to make compliant as the other pages assessed.

While the Home pages are close to the overall averages across the five pages, and the Contact Us pages have fewer average violations, the exact opposite is true for the Images pages. In all categories, except local government, there were more than the average violations for each category for these pages. This correlates with the findings in the analysis of the POUR principles, where the higher percentage of accessibility violations fall in the perceivable and operable principles. Providing alternative content for non-textual material falls mostly within the perceivable principle, success criterion 1.1.1.

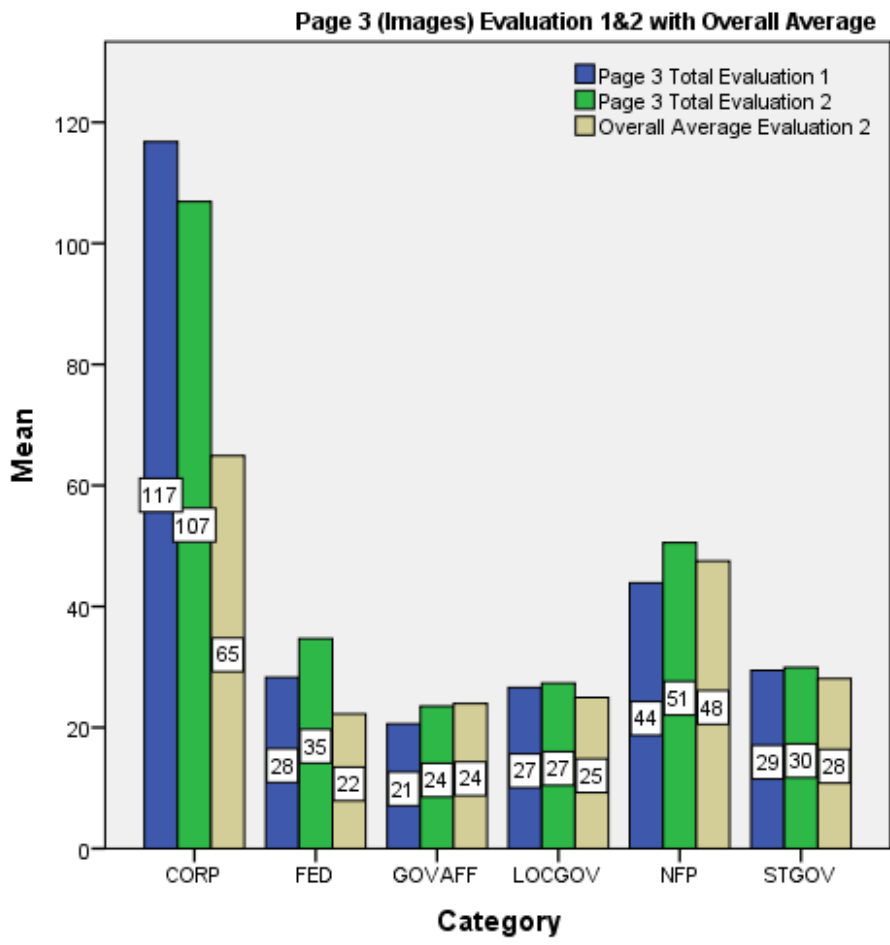


Figure 4-12: Images page for Evaluations #1 and #2 with overall averages

Page 3 of the five pages chosen from each website was selected because it contained images. It was expected that most of the errors on these pages would be in the perceivable principle. Figure 4-12 demonstrates that all except the corporate category deteriorated in accessibility between the evaluations. However, the corporate category still had considerably more violations than any of the other categories. The not-for-profit category was again almost as inaccessible. It might be argued that the corporate and not-for-profit websites would have a higher number of images and therefore a greater potential for accessibility violations in the perceivable principle. Therefore, it is possible that, in these circumstances, the type of page and the category did influence the accessibility score. It could also be argued that government websites might be less reliant on forms and other rich media and interactive content that provides greater exposure to WCAG 2.0 guideline violations. The

differences in content types in the websites was not within the scope of this research. However, it was observed that many of the government websites now contain both static images, slide carousels and multimedia content, all which have specific requirements under *WCAG 2.0*. This may indicate a trend for government websites to become more media-rich over time, which could inform future research.

In the evaluation of the pages chosen for multimedia, or complex content if there was no multimedia, the corporate and not-for-profit categories had considerably more accessibility violations and both deteriorated between the two evaluations.

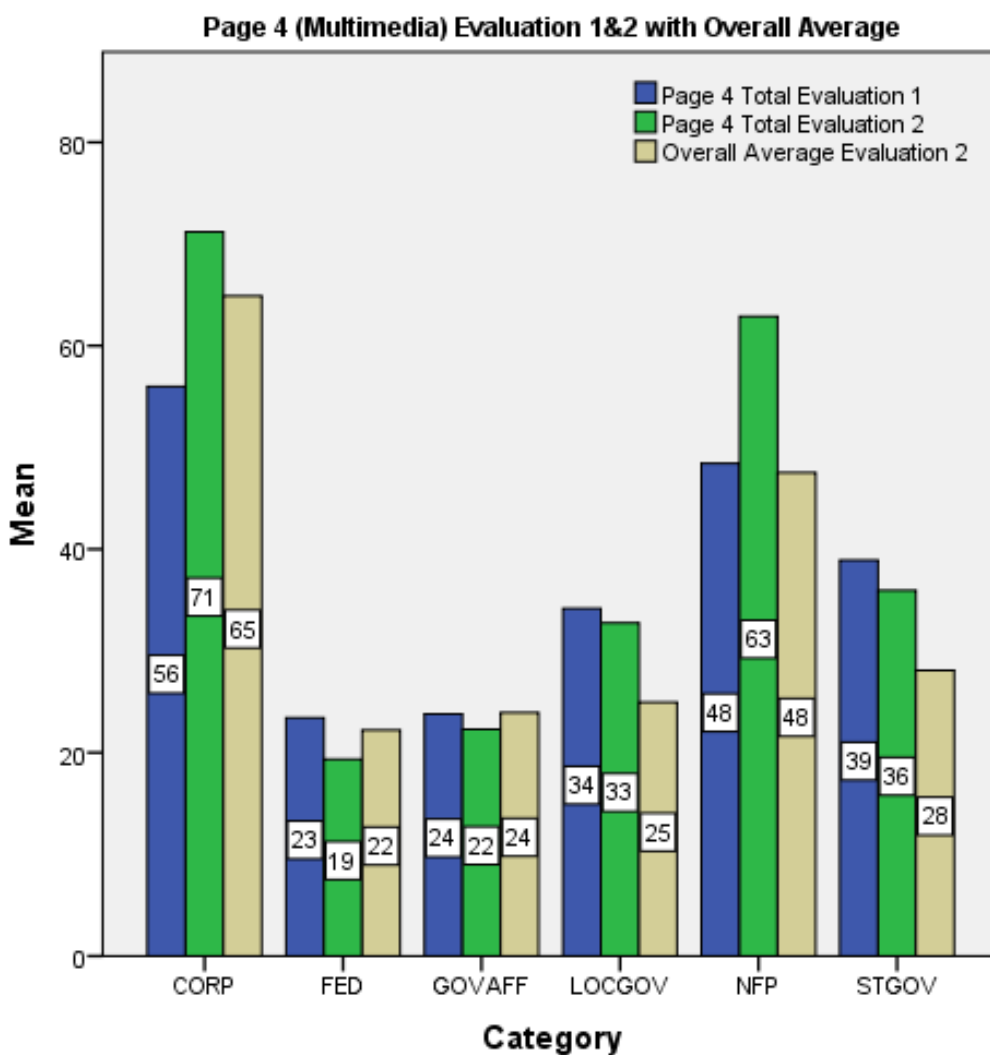


Figure 4-13: Multimedia or Complex Form Evaluations #1 and #2 with Overall Averages

Figure 4-13 demonstrates the trend for federal government websites to score considerably better than the worst two categories. However, it might be argued that the corporate and not-for-profit websites would have more multimedia features. For this reason, if multimedia content could not be located, the researcher searched for other complex content, such as detailed forms. Because the trend is so similar to other pages, the researcher believes that the overall deterioration of the corporate and not-for-profit websites is spread across their pages and is indicative of the state of the websites for these categories.

The same trends continue with the Images pages in that they display more than average violations. This reinforces the POUR ratings mentioned previously, as multimedia is largely represented by the perceivable principle. This principle requires captions for video, text transcripts for non-textual material and alternative texts for images. Complex forms are governed by the success criteria of 1.3.1 Information and Relationships, and other success criteria.

The final page chosen described the services offered by the organisation, most commonly an About Us page. The content was usually relatively simple and mostly consisted of text, often with multiple links. In these pages, as in the Contact Us pages, in most cases there were fewer than average violations. The one exception was the government-affiliated category. This would lead to an hypothesis that it is easier to create an accessible web page when the content is less complex. However, another hypothesis might be that pages are naturally more accessible when the content is simple, as developers need not employ such options as alternative content for non-textual images and captions for multimedia if those features are not present.

Page 5 (Services/About Us) Evaluation 1 & 2 with Overall Average

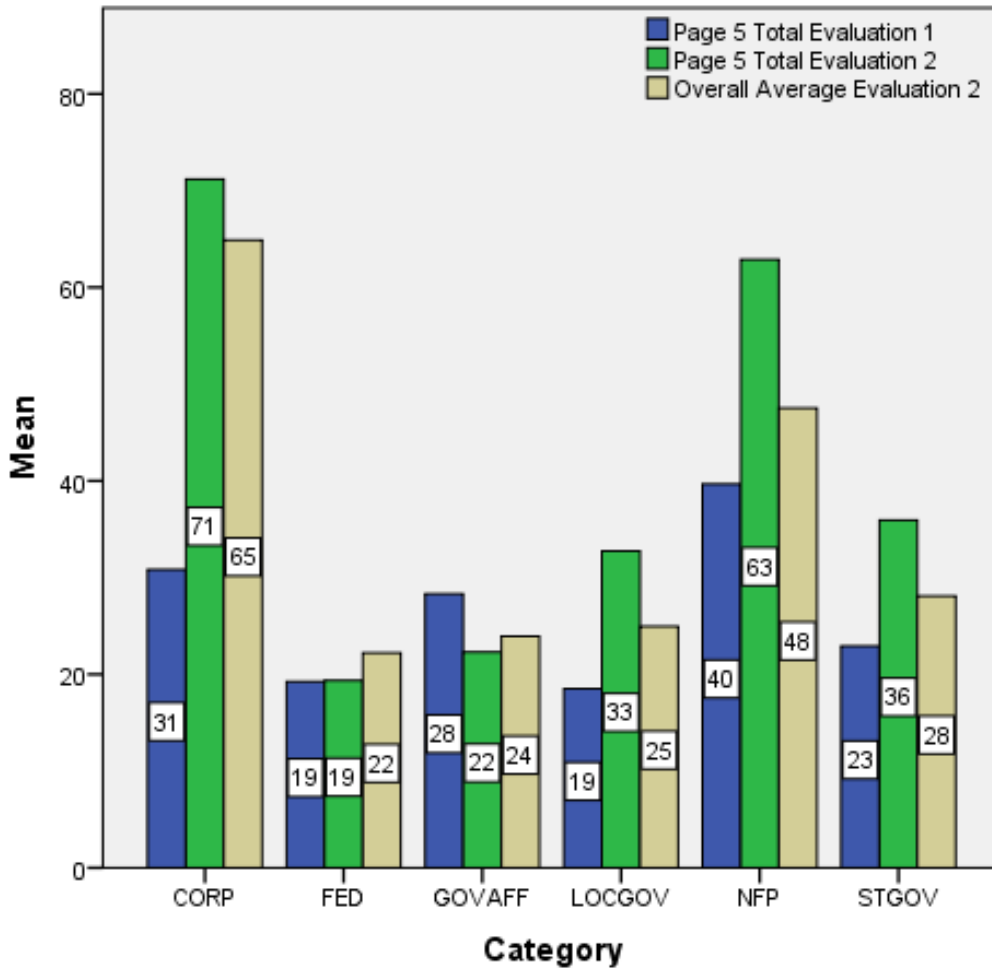


Figure 4-14: Services/About Us page Evaluation #1and #2 with Overall Averages

Figure 4-14 again demonstrates the higher rate of violations for the corporate and not-for-profit categories. The gap in the results for this page was not as wide as in other pages evaluated, possibly because of the similarity of the content. It should be noted that even for this page, both the corporate and not-for-profit categories increased substantially in numbers of violations, with the corporate category more than doubling violations from thirty-one to seventy-one. This trend was echoed to a lesser degree by the local and state or territory government categories. The federal government remained at the nineteen violations and the government-affiliated category reduced its violations from twenty-eight to twenty-two.

When the penalty points are removed from the analysis, the general trend that the corporate and not-for-profit categories have the most violations remains and echoes the findings of other analyses. There was very little difference in the results from Evaluations #1 and #2, except for the corporate and not-for-profit categories, which both deteriorated. The websites in the federal government category also deteriorated slightly, as did local government, with little change in the government-affiliated or state government websites. However, the overall trend is remarkably similar to the other analyses shown in previous graphs.

In assessing the use of PDFs without accessible alternatives, Table 4-11 clearly demonstrates the reliance of the corporate category upon PDFs. It is likely that website owners are largely unaware of the official stance of AGIMO against PDFs for government agencies, or do not feel obliged to follow its advice.

Table 4-21: Unsupported Technology (PDFs) Between Evaluation #1 and #2

Category	Evaluation #1	Evaluation #2
Federal Government	170	15
State Government	665	650
Local Government	160	165
Government-Affiliated	40	55
Not-For-Profit	40	125
Corporate	4445	3884

Examining the results of the use of PDF documents with an accessible alternative in Table 4-11, the results for the federal government are most significant, with a low score at commencement of the data collection, decreasing to a minimal level by Evaluation #2. In contrast, the government-affiliated and not-for-profit categories increased their use of PDFs without accessible alternatives, while the state or territory and local governments stayed at approximately the same level. The corporate websites improved in this category but, considering their significantly higher initial scores, their improvements were not as striking as those of the federal government. It would appear that the stance of the Australian Government and the Australian Human Rights Commission on the requirement to provide an accessible alternative for PDF documents has been taken very seriously by the federal government, but not in any meaningful way by other organisations.

4.3.4.9 MANUAL EVALUATION SUMMARY

The manual evaluations revealed that, while most categories showed an increase in violations between Evaluation #1 and #2, in some categories, such as the federal government, this was largely due to individual websites deteriorating more than a deterioration for the entire category. However other categories showed a larger proportion of websites deteriorating over the data collection period.

The results also showed that the accessibility of the home page is the most indicative of the accessibility for the website, compared to the other four pages assessed. This may be due to organisations understanding the need for users to find content by starting at the home page and depending on the navigation for this page. The necessity not to rely only upon the home page for assessment is more obvious for the least accessible categories, the not-for-profit and corporate. These results suggest that the less accessible the website, the more difficult it is to choose sample pages for assessment which may reflect the overall accessibility of the website. The analysis of the accessibility of different pages compared to the overall page average confirmed that the home page could not be considered representative for less accessible websites and that the evaluator must choose pages very carefully that reflect different types of content and usage.

Of the four principles of *WCAG*, the most violations occurred in the perceivable principle, followed by the operable principle.

Scores were computed with and without penalties for critical *WCAG* violations and the use of PDFs without accessible alternatives. When comparing the rankings of websites with and without the penalty impositions, there was no substantial changes in these rankings, except in a few circumstances there organisations made very heavy use of PDFs without accessible alternatives. These results suggest that websites which had very high accessibility violations also had high counts of critical errors and/or PDFs without alternatives. Conversely, websites that were most accessible also had lower counts of critical errors and PDFs without alternatives.

Although the manual evaluations were extremely time-consuming and a limited number of pages were selected, the results provide a very clear picture of the actual accessibility of each website. By selecting, as nearly as possible, the same pages for each website and assessing them in the same manner, the data gathered could be compared for individual websites between the two evaluation dates and also within categories. In addition, it has been possible to compare the results of different categories. Chapter 6 provides further comparisons of the different assessment methods and the results achieved.

User testing is closely aligned with manual expert evaluation in that they both involve working through a web page analytically and recording any problems encountered. However, expert manual evaluators do use some assistive technology such as screen-readers. The user testers who participated in this research used a broad range of assistive technology depending upon their particular disabilities. User testers, while generally knowledgeable about *WCAG 2.0*, are less concerned with technical compliance than they are with how well the web page works for them with their particular assistive technologies. For instance, while links may appear to be well-explained to a technical tester, when listened to via a screen reader they may be confusing if taken out of context. When users are working with voice-activation technology, they may find that links do not line up accurately with their indicator numbers or that there are numbers with no links showing, because the links may have been set to "hidden". This is often a *WCAG* failure, but may not be noticed by technical manual evaluators unless they are experienced in working with the particular assistive technologies employed by the user testers.

Most manual evaluators are experienced in the use of some assistive technologies, such as screen-readers or voice-activation, and regularly employ them in their testing. Therefore, some similarities may occur in the results (Borodin, 2010; Bradbard & Peters, 2010; Takagi, Asakawa, Fukuda, & Maeda, 2004a). The *WCAG Evaluation Methodology* states that evaluators using the *Methodology* need to understand:

WCAG 2.0, accessible web design, assistive technologies, and ... how people with different disabilities use the Web. This includes understanding of relevant web technologies, accessibility barriers that people with disabilities experience, assistive technologies and approaches that people with disabilities use, and evaluation techniques, tools, and methods to identify potential barriers for people with disabilities (World Wide Web Consortium, 2014b).

In Chapter 2, the literature review, work by Borodin et al. was cited which discussed the merits of using screen readers as part of website development (Borodin, 2010). However, evaluators are unlikely to be as efficient with assistive technology as user testers who rely upon it for their day-to-day work. User testers are often more aware of short-cuts or work-arounds for common problems than manual technical evaluators. However, Borodin et al. caution against sole reliance upon screen-reader users. Developers should not expect screen-reader users to know which appropriate strategies to use, because users have vastly different experiences (Borodin, 2010). The W3C material, *Involving Users in Evaluating Web Accessibility*, also cautions:

Carefully consider all feedback and avoid assuming that feedback from one person with a disability applies to all people with disabilities. A person with a disability does not necessarily know how other people with the same disability interact with the web, nor

know enough about other disabilities to provide valid guidance on other accessibility issues (W3C, 2010b).

Reports from user testing groups are often anecdotal in style and may be less suitable for inclusion in a quantitative analysis unless transposed by the person responsible for the evaluation. User testers appear less amenable to statistical analysis of the results as their chief purpose is to show website owner why and how they have trouble negotiating their website, rather than performing WCAG compliance tests.

This research used an experienced group of professional user testers, all of whom have disabilities (Digital Accessibility Centre, 2013). This team has been trained in the use of assistive technology relevant to their particular disability. Following training in the appropriate assistive technology, specific individuals are selected for further training to become professional user testers. There is not a specific standard for training in assistive technology or becoming a user tester. In this study, the training and employment standards were those of the Digital Accessibility Centre (DAC) in South Wales, U.K. Its training methods are considered proven in view of its length of experience and the respect the group has earned in the accessibility community in the U.K. Customers of the DAC include the British Broadcasting Network, Lloyds Bank, the Royal Mail, 3 Mobile and Channel 4. The Digital Accessibility Centre was awarded the contract for the past two years to test local government websites. Digital Accessibility Centre testers work in a supported environment, rather than remotely. Literature cited in Chapter 2 detailed some of the difficulties in performing user testing, especially when those testers are working remotely (Brajnik, 2008; Sloan, 2008).

The user testing component of this study was conducted towards the end of the data collection period, which closely related to the timing of manual Evaluation #2. While user team members were told which five pages had been selected for the manual technical testing, they were not confined to those particular pages. Their analysis was more general, specifically targeting how well overall the website met their particular needs.

While the user testers prepared anecdotal reports, the researcher also asked them to assign a rating of pass/fail for each of the criteria they assessed, with an overall mark from 1 to 5 for the group of criteria. These results were then entered into a spreadsheet and assessed. The scoring legend employed is presented below in Table 4-23.

The user testers live with disabilities such as blindness, low vision, Asperger's Syndrome, limited mobility, deafness, colour blindness, cognitive disorders and dyslexia amongst others. They tested for five major possible problems: colour contrast and readability, low vision, use of keyboard only, screen reader and voice activation. Each of these categories included set criteria for testing, as shown in Table 4-22.

Table 4-22: User Testing Criteria

Colour Contrast and Readability	Keyboard Only	Low Vision	Screen Reader	Voice Activation
Colour contrast	Highlighting	Text re-sizing	Links	Links
Readability	Tab order	Widgets	Headings	Form fields
Font style	Skip navigation	Font style	Images	Navigation
Acronyms and abbreviations	Moving content	Page magnification	Form fields	Multimedia

In each section, e.g. colour contrast and readability, the user tester was asked to provide a pass or fail grade under each criterion, such as font style: pass/fail. These scores were then tabulated, as demonstrated by the legend in Table 4-23.


 ID	colour contrast & readability	colour contrast	readability	font style	acronyms & abbrev
FD1	4	Fail	Pass	Pass	Pass
FD2	3	Fail	Pass	Fail	Pass

Figure 4-15: Extract from user testing

It is important to note that elsewhere in this study, the researcher examined the number of violations, whereas in the user testing, the user testers scored positively with a score of five being the best score possible. One was the lowest score possible, when none of the criteria was awarded a passing grade. As can be seen from Figure 4-15, a score was provided for each sub-set of the user testing criteria and then aggregated for a total score out of twenty-five possible points, i.e. each of five categories had a possible five points for each criterion.

The analysis of the user testing began with an analysis of the scores for each of the testing criteria, colour contrast and readability, keyboard only, low vision, screen reader and voice activation, for each of the six categories of websites and then delved further into the individual website categories to assess any differences in the outcomes. The full testing results for the user testing section of this research is supplied in Appendix 4-16-21.

Table 4-23: User Testing Score Legend

Score	Description
5	All four criteria pass
4	Three of four criteria pass with one fail
3	Two of four criteria pass with two fails
2	One of four criteria passes with three fails
1	None of the four criteria passes

The overall scores for all criteria differ substantially with the score for screen reader use being the lowest at an average of 2.18 of 5, which represents a failing percentage of 43.62%. This aspect also had the highest number of fails, with a multiplicity of links which did not make sense to the screen-reader user when read aloud. A correlation test was used in this instance in order to identify relationships between the type of assistive technology and accessibility issues that can be encountered in a web page.

Table 4-24: Correlation Testing for User Testing

Correlations			Colour contrast and readability	Keyboard-only	Low vision	Screen-reader	Voice activation
Spearman's rho	Colour contrast and readability	Correlation coefficient	1.000	.125	.257**	.149	-.056
		Sig. (2-tailed)		.145	.003	.082	.517
		N	137	137	136	137	137
	Keyboard-only	Correlation coefficient	.125	1.000	-.104	.415**	.396**
		Sig. (2-tailed)	.145		.227	.000	.000
		N	137	138	137	138	138

	Low vision	Correlation coefficient	.257**	-.104	1.000	.108	-.070
		Sig. (2-tailed)	.003	.227	.	.209	.417
		N	136	137	137	137	137
	Screen-reader	Correlation coefficient	.149	.415**	.108	1.000	.199*
		Sig. (2-tailed)	.082	.000	.209	.	.019
		N	137	138	137	138	138
	Voice activation	Correlation coefficient	-.056	.396**	-.070	.199*	1.000
		Sig. (2-tailed)	.517	.000	.417	.019	.
		N	137	138	137	138	138
** . Correlation is significant at the 0.01 level (2-tailed).							
* . Correlation is significant at the 0.05 level (2-tailed).							

Table 4-24 demonstrates a positive relationship between the low vision and colour contrast testing, $r=2.57$, $n=137$, $p>0.01$. There is also a positive relationship between the voice and keyboard testing $r=3.96$, $n=137$, $p>0.01$. There is a positive relationship between the screen reader and keyboard only testing of $r=4.15$, $n=137$, $p>0.01$. These strong correlative values indicate that the testing methods between keyboard-only and screen reader testing are quite similar. Screen reader users are usually unable to operate a pointer-specific controller, such as a mouse, and rely on keyboard features, such as the tab key, to navigate websites. The screen-reader user is able to press the tab key and the screen reader will announce that control or link. Users may also work through a web page by requesting a list of links, landmarks or headings, or use short-cut keys, such as the letter h, to move between headings. Such short-cuts are common to most screen-reading software.

In order to display the results of the user testing scores for the different categories, Table 4-25 provides the mean score for each of the five categories of user testing and then converts this to a percentage to illustrate pass/fail grading. As stated previously, the maximum score for a given category would be 5.

Table 4-25: User Testing Means and Percentages

Category	Mean	Percentage
Colour contrast and readability	3.70	74.01
Keyboard only	2.21	44.20
Low vision	3.24	64.82
Screen reader	2.18	43.62
Voice activation	2.96	59.13

Table 4-25 shows that the best mean scores were for the colour contrast and readability category with the lowest being for the screen-reader category.

With mean scores all being under 4.0, the data indicates that even for the best-scoring category, there was an average of just over one of the criteria which failed. Table 4-25 shows that the worst scoring category, screen-reader ($\bar{x} = 2.18$) averaged just over one of the four criteria achieving a passing grade which in turn gives that category a percentage conversion of 43.62 or a failing grade.

While the user testing did not test all five pages fully, and worked more on usability and the user journey, the manual evaluations did test each of the five pages against all of the *WCAG 2.0 Success Criteria*, thereby accounting for some of the differences in scores. In Table 4-28, the similarities in ranking places for the manual evaluations and user testing may be observed.

Figure 4-16 demonstrates the user testing results for each of the categories tested. There are some interesting differences in these results. Notably, the federal government websites performed best in the colour contrast and readability ($\bar{x} = 3.94$ of a possible 5 points) and considerably better than all of the other categories in the keyboard-only testing ($\bar{x} = 3.65$ of a possible 5 points). Interestingly, the federal government performed second last in the low vision category ($\bar{x} = 3.06$ out of a possible 5 points) with the top score gained by the government-affiliated ($\bar{x} = 3.4$ out of a possible 5 points), followed by the corporate ($\bar{x} = 3.34$ out of a possible 5 points) categories. While the screen-reader testing had the lowest mean score of all the user testing categories, the federal government websites scored considerably better than all of the others ($\bar{x} = 2.88$ out of a possible 5 points).

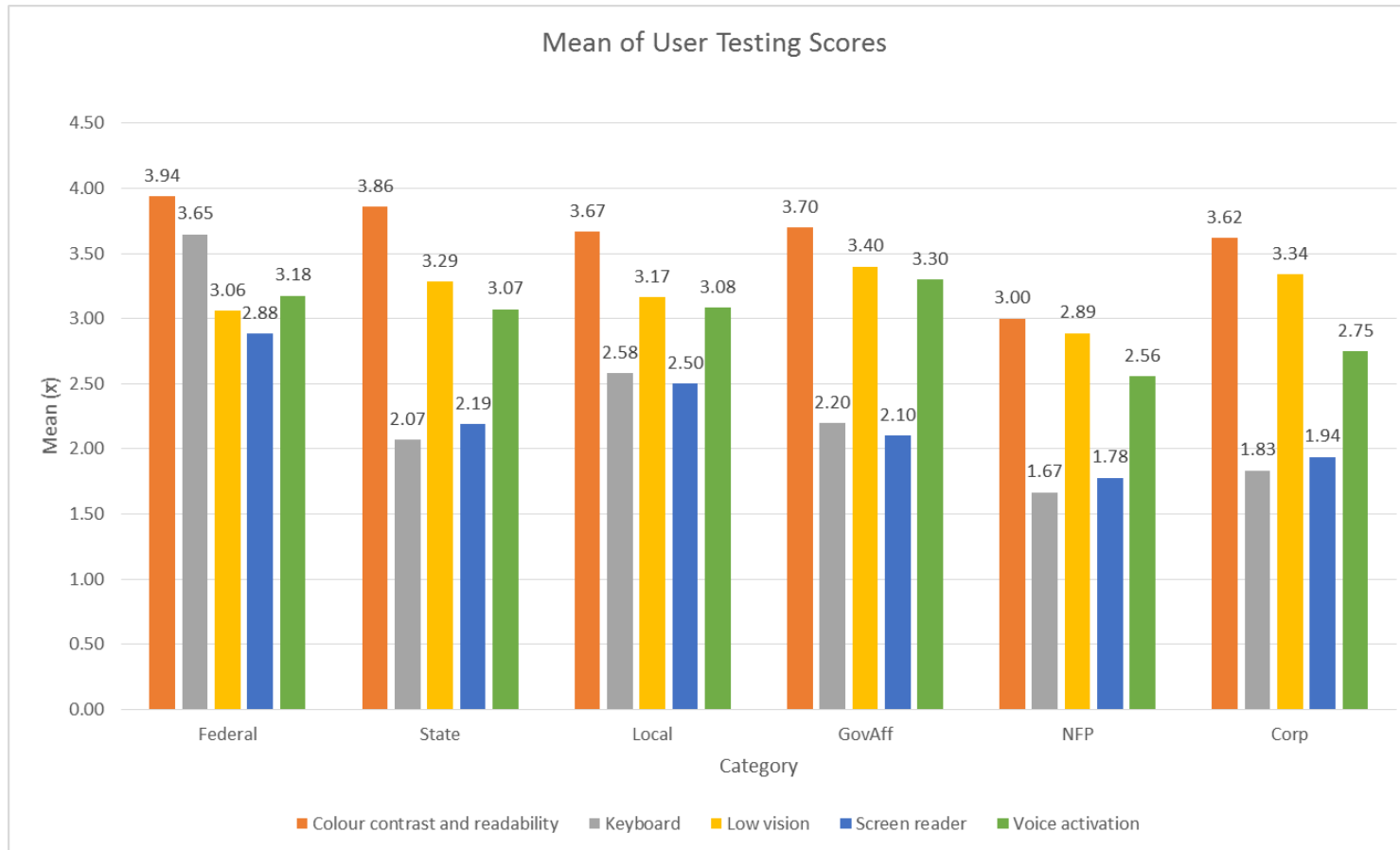


Figure 4-16: Mean of user testing scores by category

As indicated in Figure 4-16, all of the categories performed best when tested for colour contrast and readability, with the majority scoring lowest for keyboard only followed by screen reader testing.

By ranking the user testing aggregate marks, it is possible to assess the overall user testing results against each category of website to assess whether one category performed significantly better in the user testing than the others. The full ranking for the user testing is provided in Appendix 4-21.

Table 4-26: Scores for User Testing Across All Categories

Highest Scores			Lowest Scores		
Website	Rank	Score /25	Website	Rank	Total Score /25
FD11	1	24	FD13	125	10
SG15	2	23	GA2	125	10
SG17	3	21	NFP4	125	10
FD2	3	21	NFP5	125	10
GA5	5	20	NFP9	125	10
LG1	5	20	COR3	125	10
FD6	5	20	COR19	125	10
FD15	5	20	COR46	125	10
COR25	5	20	COR46	125	10
FD4	10	19	COR38	134	9
FD5	10	19	COR42	134	9

The sites which ranked highest and lowest in the user testing aggregates are also shown in Table 4-26. It is noteworthy that six of the top scoring eleven were federal government websites, which is consistent with the previously discussed manual evaluations.

The colour contrast and readability testing scored best with four of six categories of websites achieving a mean score of 3.7 or higher of a possible five points. As shown in the legend at Table 4-23, this indicates an average

of slightly more than one fail in this criterion. Conversely from Figure 4-16 the areas with the lowest scores were the screen reader and keyboard-only tests, a number of which had a mean of less than one or two out of five possible points; According to Table 4-25 they had an average of none or one criterion which passed. The five different criteria are shown in the following tables, which demonstrate the relative rankings and distribution of results.

The overall mean testing score for all the criteria was 14.22 out of a possible 25 points (see Appendix 4-21). On average, websites had 10.76 of the 20 criteria with a fail grading: in other words, the average was slightly more than 50% of the possible score as summarised in Table 4-27.

Table 4-27: User Testing Means for All Categories

Category	Colour contrast and readability		Keyboard only		Low vision		Screen reader		Voice activation		Mean overall score /25
	(\bar{x})	SD	(\bar{x})	SD	(\bar{x})	SD	(\bar{x})	SD	(\bar{x})	SD	
Federal	3.94	0.83	3.65	1.37	3.00	1.12	2.88	1.45	3.18	0.88	17
State	3.86	0.78	2.07	1.07	3.29	1.04	2.19	0.97	3.07	1.05	15
Local	3.67	0.65	2.58	1.08	3.17	0.94	2.50	0.80	3.08	0.67	15
Gov.Aff.	3.70	0.82	2.20	1.23	3.40	0.70	2.10	0.99	3.30	0.95	14
NFP	3.00	0.87	1.67	1.00	2.89	1.27	1.78	0.97	2.56	1.42	13
Corp	3.62	0.71	1.83	1.08	3.34	0.89	1.94	0.93	2.75	1.16	12
Overall	3.63		2.33		3.18		2.23		2.99		

While the corporate and not-for-profit websites account for 41.3% of the total sample group of websites, they account for 83.33% of the lowest scores. Twelve websites were chosen as the lowest scoring websites, primarily because of the convergence of websites around the score of ten out of twenty-five possible points. Even considering these lowest scoring websites in the user testing, the best results were obtained in the colour contrast or readability and low vision testing. The lowest scores were allocated to the keyboard-only and screen-reader testing, which matched the results across the whole target sample. For an illustration, refer to Figure 4-16. This may be a result of good visual design practice rather than a conscious desire of developers to meet WCAG 2.0 success criteria.

In the overall user testing, the ranking of the categories remains much the same as in the manual testing with the federal government sites performing best, and the corporates and not-for-profits scoring lowest. This is demonstrated in Table 4-27 where the mean overall user testing score for the federal government is seventeen out of a possible twenty-five points, or 68%, while the not-for-profits had a mean of twelve or 48%.

In colour contrast and readability the testers looked for any colour contrast that failed to meet a contrast level of 4.5:1, any font style with large amounts of italic text, pages with an above-average readability grading, and any acronyms or abbreviations that had not been explained in their first occurrence. The summary for the user testing of colour contrast and readability appears in Figure 4-17.

As shown by Table 4-27, the federal government category performed most strongly with a mean of 3.94 (SD 0.83) and the not-for-profit averaging 3 (SD 0.87). The colour contrast and readability testing scored the highest results overall in the user testing. It may be that more people are aware of the requirements for people with vision-related disabilities to be able to discern colour changes. Succeeding in meeting colour contrast requirements is one of the easiest and most important criteria to attain, although it may have little to do with a desire to comply with *WCAG 2.0* and more to do with good design concepts. Testing even a small sample of just five pages indicates that very few websites are able to pass the Level AA colour contrast requirements, and even fewer are able to pass Level AAA. While many people test colour contrast on their websites, they seem to neglect to test the colour contrast of form field borders, and the different states of links. It is a requirement that, in order to pass success criterion 1.4.1, colour alone not be the only means to convey information. Many website developers appear to be using different colours to indicate links and form field completion errors and to be failing to provide a secondary indicator, such as an underline that appears or disappears, when a link has focus. This means that, in order to pass success criterion 1.4.1, there needs to be a contrast ratio of 3:1 between the link text and the surrounding text.

When reading for keyboard only, the user testers check to see whether there is a logical and predictable tab order for the page, whether there is visible highlighting of the links for keyboard only users to follow, if a skip link is present and whether it works correctly, and whether there is any moving content and if there are controls present to stop, pause or hide that content.

In the keyboard-only testing, the ranking of the categories follows exactly the same order as for colour contrast and readability, however the differences are more noticeable. Table 4-27 demonstrates that the federal government websites obtained distinctly higher scores with a score of 3.65 compared to that of the not-for-profit category of 1.67. Of the nine websites in the not-for-profit category, one of the websites obtained a pass in the highlighting, two passed the tab order, none passed the skip navigation, and three passed the moving content criterion. This seemed to indicate that testing with keyboard-only has not been

accurately performed in the not-for-profit category, or that there is little to no awareness of the need for such testing. Testing by keyboard only is not a difficult test to perform as the tester must be able to use the tab key to access all links and controls. This is really one of the most basic requirements for users, to be able to access links and controls. Many users are unable to use pointer-specific controls, such as a mouse, either due to limb mobility issues, shaking hands, or finding it difficult to be able to see the links clearly. For this reason, many users prefer to proceed through a web page by using the tab key.

User testing for low vision involves testing whether the page content can be re-sized with browser controls, whether any widgets on the page may be re-sized, whether a user can magnify the page to 200% without loss of content and whether there are any colour contrast areas that fail to meet a contrast level of 4.5:1.

There is less variation in the scores for the low vision criteria than for the others previously discussed. However, it is worth noting that the federal government websites scored lower in relation to other categories than in any of the previous user testing assessments. The criteria in this category include text re-sizing, widgets, font style and page magnification. The highest average, of 3.4, was achieved by the government-affiliated category with the lowest being the for not-for-profits, at 2.89. The overall average for low vision was 3.24 which translates to a percentage of 64.82.

Testing by users for screen-reader use involves determining whether the links make sense when read aloud, whether headings have been properly marked-up so that the screen reader recognises them as headings and if there is a correct hierarchy of structure, whether there are any unlabelled images and whether there are any unlabelled form fields or any form fields that lack proper description.

For the screen reader testing, the pattern reverts to the normal pattern, with the federal government agencies scoring the highest with the corporate and not-for-profit category scoring the least. While the overall average was 2.18, the federal government websites had a mean score of 2.88, while the not-for-profits had 1.78. The screen-reader testing produced the lowest overall mean score of 2.18 with a standard deviation of 1.05 as shown in Table 4-27. Screen-reader software in the past has been quite expensive, often over \$US 1000 for a licence. However, with the arrival of free screen-readers such as Non Visual Desktop Access (NVDA) and web-based readers, it is now much easier for website owners or developers to test their own content with a screen reader.

Voice activation testing by users involves testing if all links can be tagged via the domain name system (DNS), if all form fields can be tagged via the DNS and can be dictated into, whether there are any mouse-only events such as the main navigation, and whether or not there are controls accessible via the DNS for multimedia. In the voice activation category, the federal government scored slightly lower, at 3.18, than the government-affiliated, at 3.30, but otherwise the order remained much the same as in the other analyses.

A number of the websites scored what the user testers considered a passing grade in all of the criteria in the category. In particular, website FD11, its results displayed in Table 4-26, achieved perfect scores in four out of five criteria, but only scored 4 for colour contrast and readability. This contradicted the general trend of typically being the criterion with the highest scores. However, it merely indicated that the testers rated the criterion of readability as having been failed.. As all of the testers rated this as the best website, it does show continuity across the user testers' analyses.

It is useful to observe the respective ranking of the federal government websites for both the manual Evaluation #2 and the user testing to determine how closely the two methods worked. However it is important to remember the previous discussion on the different purposes and methods used by each testing type. It is also important to note that in the manual evaluation FED17 was not included as it was not available at the time of the first manual evaluation.

Table 4-28: Comparison of Manual and User Testing Ranking for Federal Government Category

Manual Evaluation Rank (Evaluation #2)	User Testing Rank
FD4	FD11
FD12	FD2
FD11	FD6
FD9	FD15
FD16	FD5
FD3	FD4
FD2	FD17
FD5	FD3
FD15	FD16
FD8	FD12
FD7	FD8
FD6	FD7
FD13	FD10
FD10	FD1
FD1	FD9
FD14	FD14
	FD13

Table 4-28 shows that both testing methods placed FD14 near the lowest rank and both placed FD11 in the top ranking websites. The arrows in this figure indicate those websites which were ranked in close proximity by both methods. Difference in ranking would occur due to different pages being examined, and the aforementioned usability versus technical WCAG 2.0 compliance testing methods.

The mean score for overall user testing for the Federal Government websites was 16.65 with a standard deviation of 3.77. The websites in this group had an average number of failing criteria of 8.41 out of a possible twenty criteria with a standard deviation of 3.87. Fourteen of the seventeen websites in this group, 82.35%, scored at least a passing grade of fourteen out of a possible twenty-five points with six of the seventeen, 35.28%, scoring nineteen or more, or 75%.

In Figure 4-16, the data was provided for all of the categories of user testing. Breaking the results down further allows an assessment of the results according to each of the testing categories.

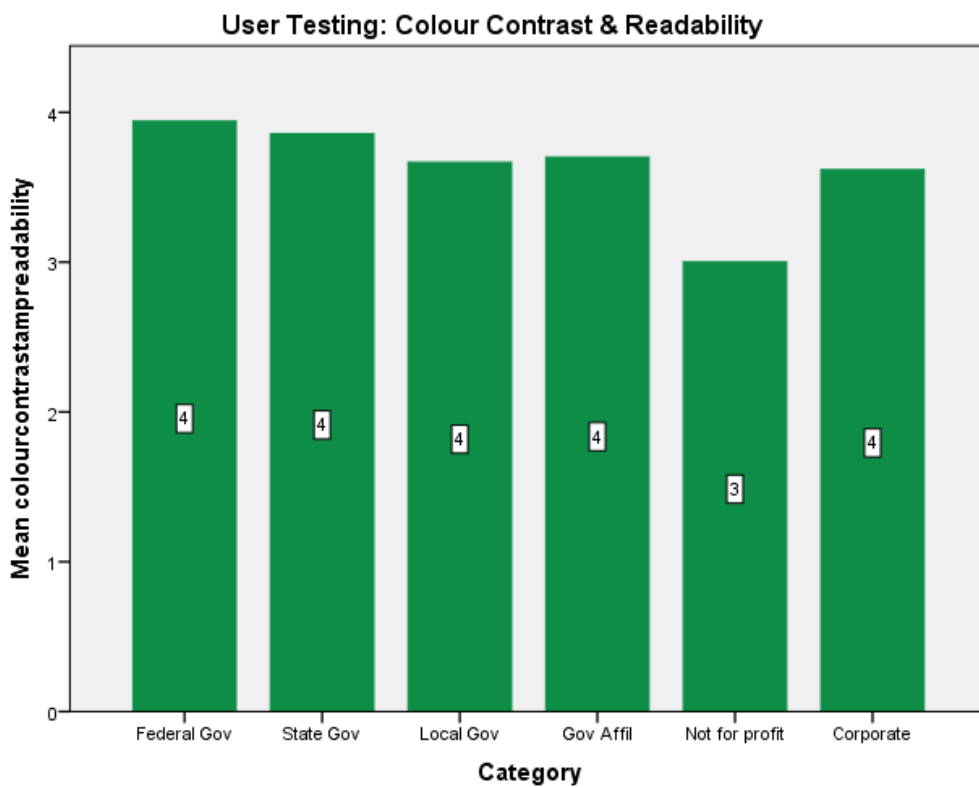


Figure 4-17: User Testing Colour Contrast & Readability

Figure 4-17 demonstrates that, while the federal government category performed best in colour contrast and readability, followed by the state government websites, there was not a significant difference between the categories except for the not-for-profits. Previously, in Table 4-27, the data showed that almost all of the

websites in the federal government category achieved four of a possible five points ($\bar{x} = 3.94$), meaning that on average they had just slightly more than one failing point in the four criteria being tested.

Figures 4-18 and 4-19 demonstrate the differences between the user testing results for the highest, federal government, and lowest-performing, corporate categories. Figure 4-18 demonstrates the best results obtained by the federal government category in colour contrast and readability.

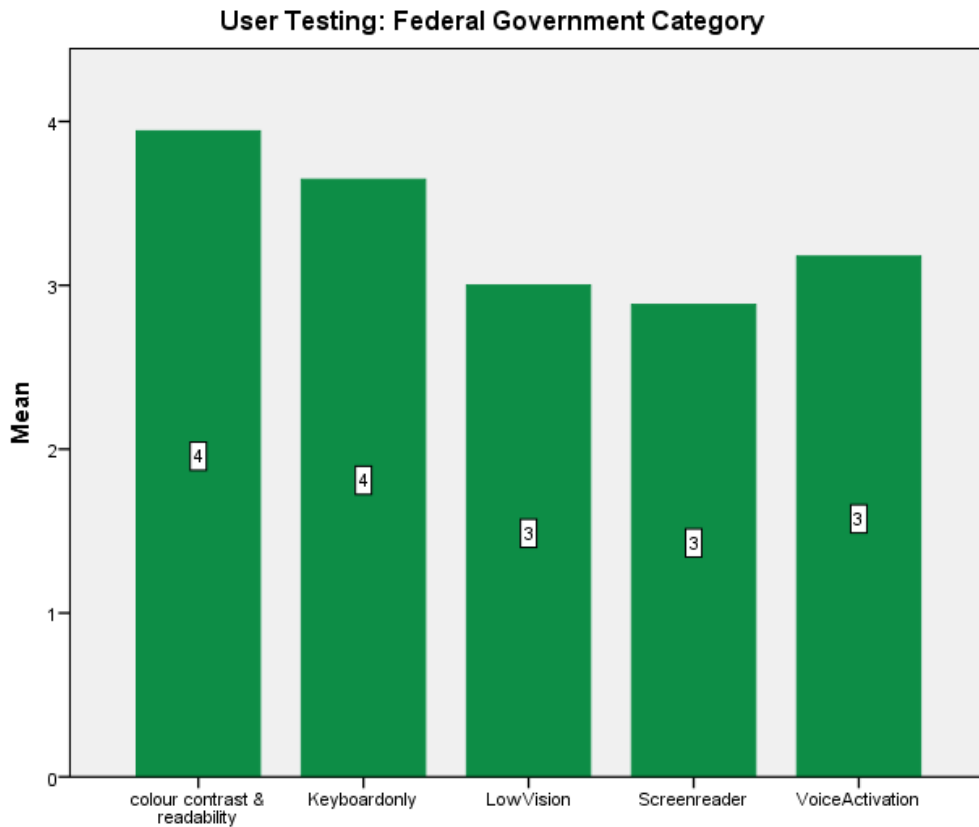


Figure 4-18: User Testing: Federal Government Category

Figure 4-18 demonstrates the lowest scores in the low vision and screen-reader testing, differing from the corporate category shown in Figure 4-19. In the corporate category there are very low scores in the keyboard-only ($\bar{x} = 1.83$) and screen-reader ($\bar{x} = 1.94$) user testing

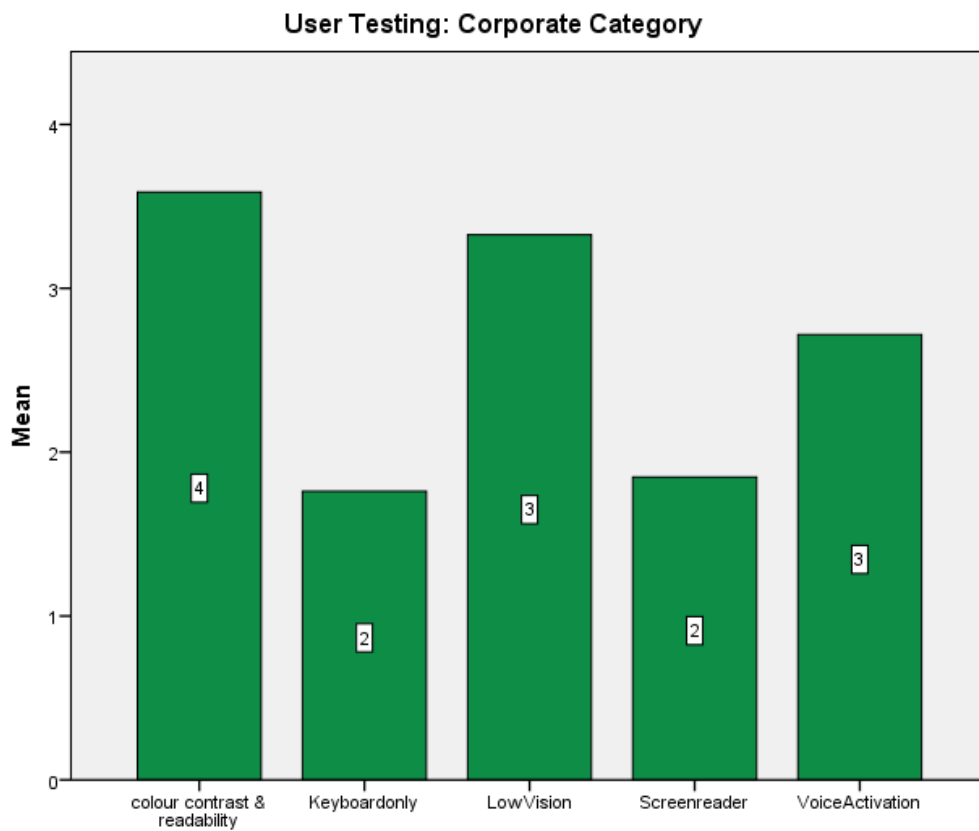


Figure 4-19: User Testing: corporate category

The corporate sector had a similar mean ($\bar{x} = 3.62$, SD 0.71) for the colour contrast and readability criterion to with the federal government ($\bar{x} = 3.94$). While the federal government websites had approximately one third, 29.41%, of the websites achieve five of a possible five points, the corporate sector had three of forty-eight, 6.25%, achieve this same score. None of the corporate websites scored 1, i.e. none failed all of the criteria, but twenty-six, 63.41%, of the websites scored four of a possible five points.

As the government websites, federal, state or territory, local government and government-affiliated, made up 58.7% of the websites, and the remaining 41.3% was made up of the not-for-profit and corporate websites, it is useful to compare these two groups.

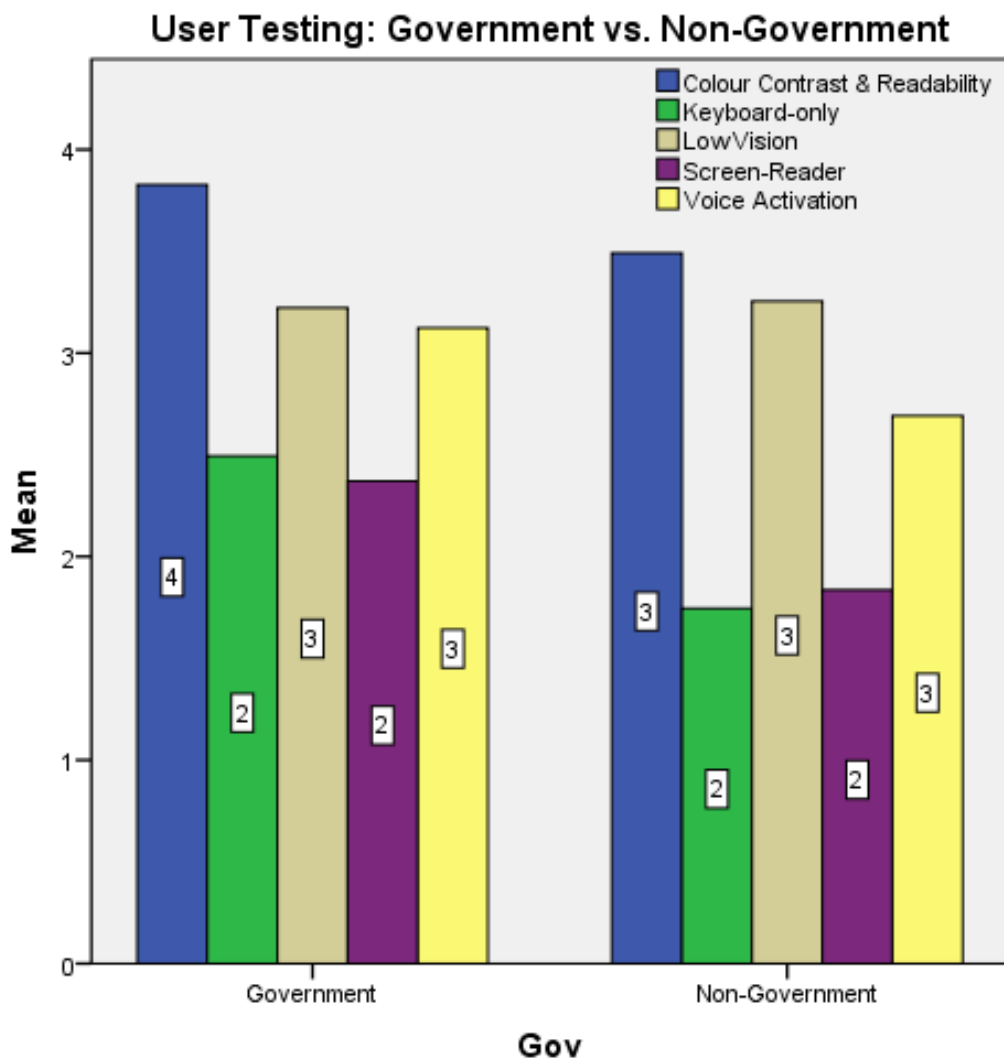


Figure 4-20: User Testing: Government vs. Non-Government

Figure 4-20 shows that the government websites performed better in the colour contrast and readability user testing than the non-government websites. However, in the other categories there is not an appreciable difference in the mean scores.

It might be argued that, for this particular criterion, colour contrast and readability, resourcing for accessibility is directly related to the size and/or type of organisation, it being obvious which organisations lack sufficient financial resources. For example, from Table 4-14, it is observed that the lower results for the non-

government grouping was due to the score for the not-for-profit category. This sector may find it more difficult either to fund accessibility development or testing or to acquire the necessary skills to produce accessible content. This finding directly relates to the first supporting question, which asks whether the type of organisation plays a role in the demonstrated levels of accessibility.

Reviewing Table 4-26, there is a continued trend observed in other testing where the federal government performed better than other categories. The testing by screen reader had the lowest overall scores for the user testing. The federal government websites performed best with above average scores for these criteria, compared to the overall results for which \bar{x} = 2.33.

The general trend continued for the non-government websites in the screen reader testing with the lowest-score for the not-for-profit websites. A score of 1.78 can be expressed as less than one pass out of the four possible criteria, links, headings, images, form fields, that were tested by the screen reader users. A score of 1, as shown previously, means that there were no items out of the four tested that were given a pass grading, where a score of 2 means that one of the four criteria was awarded a pass. This is a serious situation for screen-reader users who constitute a large proportion of the users of assistive technology.

Figure 4-21 displays the overall user testing scores, divided into government and non-government. This division of the websites is provided in order to remove any possible confusion related to the number of websites in each category, with not-for-profit comprising only 6.52% of the total websites in the sample, compared to 34.78% for the corporate as shown previously in Table 4-7.

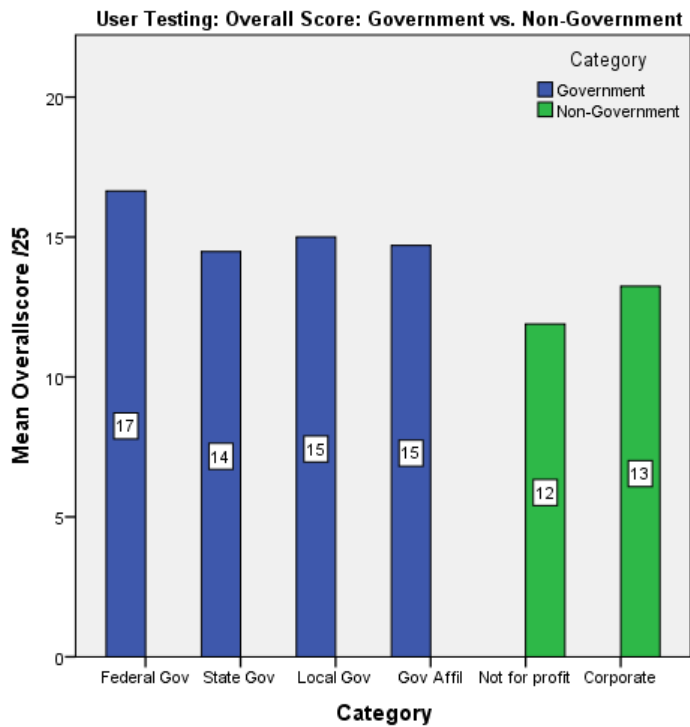


Figure 4-21: User Testing: Government vs. Non-Government

The possible hypothesis proposed earlier, that both the local government and not-for-profit website categories scored lower in the colour contrast and readability because of the possible lack of resources and/or expertise, was only partially reflected in the overall user testing scores. The government results shown in Figure 4-21 demonstrate that, while the federal government websites are considered by the user testers as the most accessible, the local government sites score slightly better than those of the state or territory governments. It was apparent, from the overall user testing scores, that the not-for-profit websites were consistently considered less accessible by the user testing team than either the government-affiliated or corporate websites.

In Table 4-29, the data was further simplified to demonstrate the overall user testing scores for both government, including federal, state or territory, local and government-affiliated agencies, and non-government sites, not-for profit and corporate, to see how they compared across the range of user testing scenarios.

Table 4-29: User Testing: Government vs. Non-government

Category	Mean	SD
Government	15.08	2.96
Non-Government	13.28	2.61

While neither group could clearly claim they are accessible, the government websites clearly show that overall they are more accessible to people with disabilities than the non-government websites, as \bar{x} = 13.28, and SD = 2.61. This leads to a positive response to the question of whether the type of organisation plays a significant role in the accessibility of the website. This also relates back to the primary research question, which asks if a government-mandated policy is successful in bringing about greater accessibility for the websites in that category. It is not possible to say if the NTS has been successful from the user testing data here. However it is possible to say that government websites are more accessible than non-government websites.

4.4 AUTOMATED TESTING

While there is much debate in the literature and practitioner landscape on the relative advantages and disadvantages of automated testing, there is little doubt that automated testing has a distinct place in website accessibility evaluation. Some organisations perform automated testing as a means of bench-marking their websites' evolution and of observing trends that can be mitigated, such as marked increases in a specific type of violation such as images lacking alternative text.

It was decided to configure the automated tool to check 2000 pages of each website. This number was chosen rather than asking the tool to check every page of the website for a number of reasons. The chief reason is the time that would be required to perform repeated scans of the websites if every page was assessed, many of the websites having over 50,000 pages. The other reason is that some of the websites were smaller, for example taxi companies, and this might result in a distorted view of the accessibility of the websites. It was noted that some of the websites did not even have the 2000 pages and thus a percentage of pages with accessibility violations was included.

It is possible to configure *SortSite* to check a specific number of pages (Powermapper software, 2010). This is currently done by adding a windows registry maxpagecount of 2000. This tool is somewhat biased towards pages or resources that are within a few clicks from the starting page of the assessment, bearing in mind that the assessment can be started from any web page within the target website. In order to select the pages to be

tested, the user adds the starting page and this is put into a list of URLs_to_visit. Next the unvisited page from URLs_to_visit is picked up and the HTML of the page is searched for a list of URLs, A HREFs, IMF SRCs, SCRIPT SRCs, LINK HREFs, IMG LONGDESCs, etc.. For each URL on the page that is not already in the list of URLs-to-visit, if the page count is still less than the set target of 2000, the URL is added to the list of URLs-to-visit.

Figure 4-22, provided by *SortSite* (Rogers, 2013), demonstrates the order in which this automated tool selects pages for a specific number for the sample.

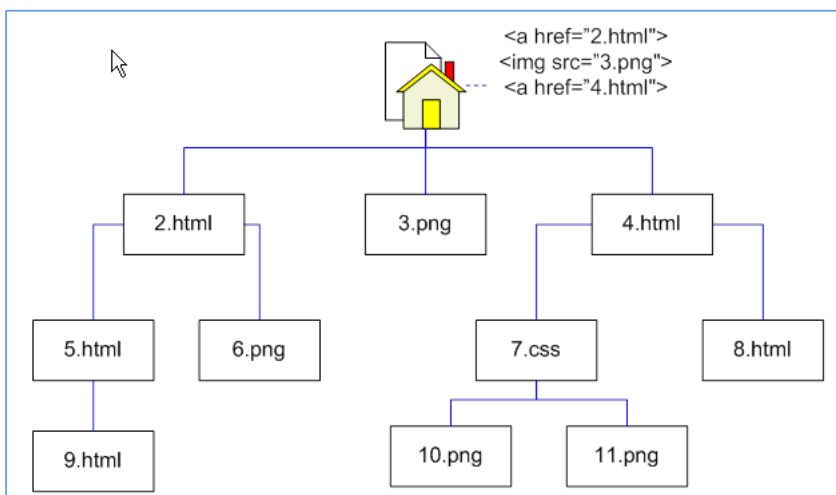


Figure 4-22: *SortSite* Method for Selecting Pages

As discussed in (Vigo et al., 2013), there are issues regarding correctness, completeness and coverage which can aid in deciding which, if any, automated tools will be most useful for any given accessibility evaluation.

SortSite reports the following methods for ensuring that their tool meets the requirements:

1) We document what we test here:

<http://www.powermapper.com/products/sortsite/rules/accwcag2.htm>

Worth noting this list changes slightly each release: we add new checks from time to time and occasionally disable existing ones (like the IFRAME alternative we discussed a couple of months back).

2) We periodically review this when WCAG2 techniques change. We also report techniques bugs back to W3: recent examples were :

- a failure example being identical to a success technique

- an inconsistency where one page said ALT=" " (single space) was forbidden and some others said it was OK (turned out to be not OK, and single space ALT produced worse results than omitting ALT)
- 3) We have built in feedback mechanisms to encourage customers to report problems (Report Broken Rule)
- 4) We have around 850 test cases we run automatically against the WCAG2 rules. These are very similar in concept to the WCAG2 failure examples documented in Techniques for WCAG2.
- 5) We run periodic scans of sites that should have good accessibility like w3.org/wai to look for false positives. Worth noting there are still quite a few true positives there – committee notes done before WCAG2 was standardised, and a set of example failure pages amongst others (Rogers, 2013).

In (Vigo et al., 2013), the *SortSite* (Powermapper software, 2010) tool was shown as one of the tools with the most balanced approach to false positives and false negatives. When this researcher used *SortSite*, the desktop/installable application was chosen due to its ability to run numerous instances at one time, five being the optimum for not interfering with other currently-running software. Had the researcher chosen the cloud-based version, running numerous instances at the same time would not have been possible and would have meant that a reduced number of evaluations could have been run.

Another issue in the selection of an automated tool is whether it can check the browser document object model (DOM). Tools such as *aDesigner* have been created to check the DOM rather than relying on syntactic checking of pages which limits the errors that can be checked to the level of the tag description layer (Groves, 2013a; Takagi et al., 2004a). According to tests conducted by Karl Groves in 2013, *SortSite* was one of only two automated tools available free online which test the DOM (Groves, 2013b; Powermapper software, 2010).

4.4.1 BENEFITS AND LIMITATIONS

In the *WCAG-EM* (World Wide Web Consortium, 2014b) it is acknowledged that automated tools are useful in scanning entire websites to identify specific pages that warrant further evaluation. Automated tools may assist the tester to find patterns or clusters of issues that would be difficult to locate manually. Some of the benefits and limitations of automated tools are provided in Table 4-30.

Table 4-30: Automated Testing: Benefits and Limitations

Benefits	Limitations
Reduced time and cost to perform. 7200 times faster e.g. 1 page per second compared to 1 page per two hours.	At the very best can check 50% of the guidelines – known as coverage, average 18 – 35% depending upon tool.
Helpful for performing analytics –longitudinal studies of a website’s accessibility changes	Problems with completeness (false positives) and correctness (false negatives)

Can check all links easily	May produce a lot of noise or correctness that takes considerable user time to check
May be able to discover areas well-hidden that might be difficult for a manual tester to discover	Requires the tool to be continually updated to reflect changes in technology and sufficient techniques that may be used to address these e.g. PDFs
Less technical knowledge needed to use tool or interpret results	
Provide great breadth of coverage, for tools that check batches of pages as compared to page a time tools such as toolbars.	
Low false positive ratio depending upon tool used	

While Table 4-30 provides benefits and limitations of automated tools, it must be considered in light of the different tools available and also upon the type. One type of automated tool processes pages in batches, in some cases allowing a user to test every page of a website. The other type processes pages one at a time, for example with accessibility toolbars. The second type, single page, is used more as an assistant to the manual evaluator than as a sole means of evaluating websites. These tools are particularly useful in providing visual indicators of issues in situ which allows the evaluator to take a screen capture to demonstrate to the website owner/developer of the location of the issue.

4.4.2 RELIANCE UPON AUTOMATED TESTING

Many organisations rely on the use of automated testing and this has been discussed in Chapter 2 in the literature review. In particular, the author has participated in a research project paper *Benchmarking Web Accessibility Evaluation Tools: Measure the Harm of Sole Reliance on Automated Tests*. (Vigo et al., 2013) In this paper, *SortSite (Powermapper software, 2010)* was the tool found to have the most balanced approach with regard to coverage, completeness and correctness. Coverage relates to the number of WCAG 2.0 success criteria that are reported by the tool. Completeness relates to the ratio of reported violations to the total number of accessibility violations that exist. Correctness relates to the correct reporting of errors, minimizing the number of mistakenly reported errors.

Brajnik (2008) concurs stating “using *only* automated tools is not by itself a viable solution to the problem of evaluating accessibility”. The W3C WAI provides information regarding what evaluation tools cannot do:

Many accessibility checks require human judgement and must be evaluated manually using different techniques. Also, in some cases evaluation tools are prone to producing false or misleading results such as not identifying or signal incorrect code. The results

from evaluation tools should not be used to determine conformance levels unless they are operated by experienced evaluators who understand the capabilities and limitations of the tools in order to achieve accurate results. Web accessibility evaluation tools can not determine the accessibility of Web sites, they can only assist in doing so (W3C/WAI Education and Outreach Working Group, 2005).

4.4.3 AUTOMATED TEST RESULTS

In Chapter 4.1.1 it was noted that some of the websites did not have 2000 pages in their websites and in order to compensate for this, the mean number of pages with accessibility violations from the number of pages found was calculated. For example if there were 2000 pages checked and 245 errors were found, the calculation would be $245 \times 100 / 2000 = 12.25\%$ and if there were only 1000 pages checked, this would calculate as $245 \times 100 / 1000 = 24.50\%$.

Table 4-31: Automated Testing Mean of Violations

Test number	Category					
	CORP	FD	GOVAFF	LOGGOV	NFP	STGOV
	Mean	Mean	Mean	Mean	Mean	Mean
Automated 1	69.7	71.2	99	93	71	110.6
Automated 2	158.5	84.1	203.4	178.6	154.1	231.3
Automated 3	164	159	203	183	153	234
Automated 4	164	158	204	180	148	159
Automated 5	170.5	164.3	198.4	175	147.2	172.7
Automated 6	158.8	164	192.9	191.8	146.6	169.8
Automated 7	151.4	153.9	189.8	193.7	143.9	158.8

In Table 4-31 the mean of the actual violation numbers for each category is shown. It should be noted that Automated assessment #1 demonstrates abnormally low violations compared with the subsequent assessments. The automated tool was upgraded after assessment #1 and, after careful analysis, it was determined that the upgrade was the reason for the abnormal results. The calibration of the tool was carefully

documented before further scans. For purposes of clarity and correctness, assessment #1 has been removed from any following graphs from Table 4-33. Assessments #2 and #7 are the first and final groups of results shown in the following comparisons of the automated testing results. An example of the automated results for one website, COR33, is provided in Table 4-32 to demonstrate the abnormal results for the first automated evaluation.

Table 4-32: Automated Results for Case COR33

Test number	# pages/files checked	Overall quality	Pages/files with accessibility violations	% of pages checked with accessibility violations
Automated 1	135	53	27	20
Automated 2	141	67	48	34.04
Automated 3	141	67	48	34.04
Automated 4	140	66	48	34.29
Automated 5	141	65	49	34.75
Automated 6	142	65	49	34.51
Automated 7	142	65	48	33.8

As may be seen from the data in Table 4-31, the results from automated tool do not parallel those of the manual or user testing. Highlighted results of Automated 2 and Automated 7 reveal that the corporate and not-for-profit categories improved, gaining lower mean violation counts, compared with the federal government category, which showed a greater than 77% increase in the percentage of pages with accessibility violations located by the automated tool.

As mentioned earlier, it was determined that in order to present results more accurately for websites that did not have 2000 pages, results would be based upon percentages of pages checked with violations. This is shown in Table 4-33 and onwards as the Adjusted mean in order to differentiate the data from the actual mean.

Table 4-33: Automated Testing: Mean and Adjusted Mean

Test number	Category											
	CORP		FD		GOVAFF		LOGGOV		NFP		STGOV	
	Mean	Adjusted Mean	Mean	Adjusted Mean	Mean	Adjusted Mean	Mean	Adjusted Mean	Mean	Adjusted Mean	Mean	Adjusted Mean
Automated 2	158.5	10.83	84.1	4.57	203.4	13.64	178.6	9.76	154.1	13.7	231.3	13.06
Automated 3	164	11.07	159	8.32	203	13.62	183	9.91	153	13.14	234	12.4
Automated 4	164	11	158	8	204	14	180	10	148	13	159	10
Automated 5	170.5	11.7	164.3	8.6	198.4	12.84	175	10.24	147.2	11.97	172.7	10.72
Automated 6	158.8	10.98	164	8.41	192.9	12.72	191.8	9.9	146.6	11.57	169.8	10.32
Automated 7	151.4	10.05	153.9	8.06	189.8	13.32	193.7	10.04	143.9	9.65	158.8	9.87

Table 4-34: Automated Testing: Comparison of Mean and Adjusted Mean

Category	Ranking by mean Automated #2	Ranking by Adjusted mean Automated #2	Ranking by mean Automated #7	Ranking by Adjusted mean Automated #7
Federal Government	1	3	1	1
State Government	6	4	4	3
Local Government	4	6	2	6
Government-Affiliated	5	5	6	5
Not-For-Profit	2	1	5	2
Corporate	3	2	3	4

Table 4-34 provides details the rankings of the categories according to the automated testing, by both the actual means and the adjusted means, for Automated #2 and Automated #7. The largest differences observed were for the federal government and the not-for-profit categories. As the federal government included some of the largest websites and the not-for-profit some of the smallest, these results are not surprising. However, by the time Automated #7 was completed, the federal government websites remained in first place whether or not the means were adjusted for size. However, the not-for-profit moved up the rankings from fifth place for the non-adjusted mean to second with the adjusted mean. Using the adjusted mean to compensate for the website size produces a more accurate picture of the automated testing results. When the means were adjusted, the local government websites were ranked in sixth place in Automated #2 and remained there in Automated #7.

When one considers the accessibility violation scores across the categories between Automated #2 and #7, the federal government websites demonstrate a marked increase in violations while the state government websites show a marked decrease. However, the remaining four categories show only slight increases or decreases in scores. It is necessary to consider the adjusted means in order to see the true picture, due to the potential for error caused by differing numbers of pages present on the websites. Some websites tested had fewer than 2000 pages in total.

The categories in Figure 4-23 have been divided into government and non-government in order to see if the type of website produced different results in the automated testing.

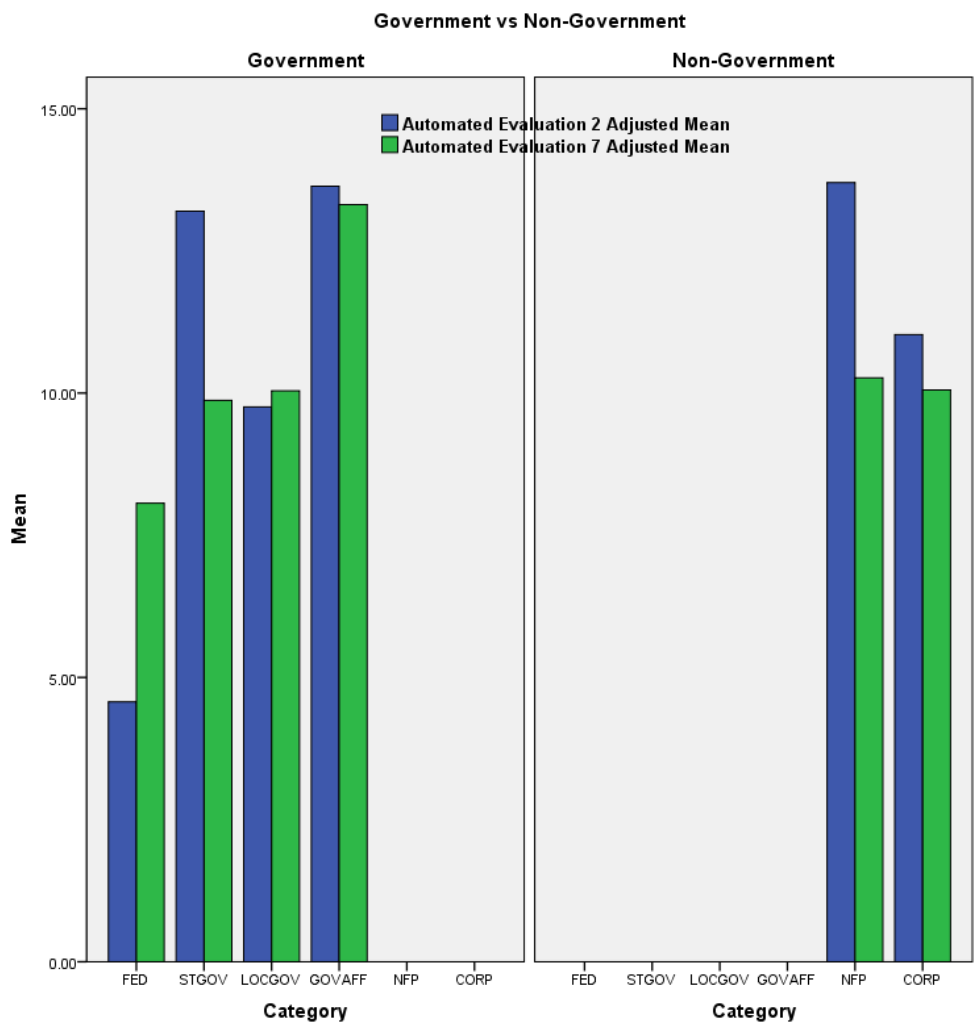


Figure 4-23: Automated assessment #2 and #7, showing adjusted means

Figure 4-23 demonstrates that, when calculated by the automated tool, percentages of accessibility violations decreased for four of the six categories. The exception was the federal government websites, which showed a marked increase in violations between the two assessment periods. This corresponds to the results shown for this category in Table 4-31, as all of the federal government websites totalled more than 2000 pages. The categories which showed the most deterioration in the manual assessment, the not-for-profit and corporates, showed fewer violations in the automated testing, while the state government and government-affiliated categories showed improvements. However, it should be noted that while the adjusted means for the federal government show a considerable change from 4.57 to 8.06, 8.06 is less than any of the before or after results for the other website categories. In these automated tests, the government-affiliated websites scored very

high levels of violations, with little improvement between the beginning and final assessments. The results for the corporate category showed a slight improvement and the not-for-profit, while scoring the highest number of violations at the beginning of the data collection period, showed at its end a result analogous to the other categories.

Modifying the automated testing to show the adjusted means, i.e. percentages of pages with accessibility violations, demonstrates that the greatest variations occurred in the not-for-profit websites. These results make sense when it is remembered that websites with the smallest numbers of pages occurred in this category.

For the federal government category, the deterioration in automated testing results was largely due to websites FD9, which increased from 116 violations, 5.83%, in Automated #2 to 260, 13.06%, in Automated #7, and FD13, which had 164, 8.6%, violations in Automated #2 and 321, 16.39%, in Automated #7.

Table 4-35: Comparison of Best Performing and Worst-Performing Manual Evaluation Results to Automated Results

	Best-performing federal government websites in manual Evaluation #2		Worst-performing federal government websites in manual Evaluation #2	
	Website FD4	Website FD2	Website FD1	Website FD14
Automated 2	4.64	2.32	1.5	3.32
Automated 7	10.59	4.84	5.56	11.51
Overall means for automated evaluation	Automated evaluation #2 =5.18 (SD 2.33)		Automated evaluation #7 =9.96 (SD 4.31)	

It was possible to compare the results for the two best and the two worst websites in the automated testing with those for the same websites in the manual testing to see if there was any consistency between the two methods. The results are strikingly dissimilar. In Table 4-35 the two best- and two worst-performing federal government websites in the manual assessments are compared with their automated test results. There was an increase in accessibility violations for all four websites between Automated assessments #2 and #7. The lack of any relationship between the manual testing results and those from the automated tool is evident. FD1 was one of the worst-performing federal government websites in the manual testing, yet is the best of that category in the automated testing. Conversely, FD4 was the best-performing of all the target group of websites in the manual testing, yet ranked 83 of 139 in the automated testing.

It is important to note that the manual evaluations included the same five pages for each of Evaluation #1 and 2. However, the automated testing analysed 2000 pages of each website, which may not have been the same in each of the seven evaluations. Figure 4-22 illustrates the method that *SortSite* used to select these 2000 pages (Powermapper software, 2010). This was a contrast to the targeted selection of websites before the manual evaluations. This difference in selection may have contributed to some of the discrepancies between the automated, user and manual evaluation results.

There are considerable disadvantages, from an accessibility point of view, in relying solely on the results of automated tests. An automated tool cannot test all criteria. An important criterion involves the ability to determine if images are accompanied by suitable alternative text. While an automated tool may test for the presence of alternative text, it may not be able to determine if a particular image is adequately and fully described. The harm that may be caused by reliance on automated testing is discussed in Vigo et al. (Vigo et al., 2013).

This tab shows accessibility issues, indicating problems for disabled users.

WCAG2		Key	
A	●	●	Priority A - disabled users will find it impossible to use some pages
Priority	URL / Description	Guideline	Line
⊘ ●	A reference has been made to a non-existent ID.	WCAG2 A F17	Options ▾
⊘ ●	Each A tag must contain text or an IMG with an ALT tag.	WCAG2 A 2.4.4	Options ▾
⊘ ●	Headings should not be empty.	WCAG2 A 1.3.1	Options ▾
⊘ ●	Some pages have the same title, so the title cannot be used to distinguish pages.	WCAG2 A F25	Options ▾
⊘ ●	This form control has no associated LABEL element.	WCAG2 A F68	Options ▾
⊘ ●	This LABEL refers to a non-existent control.	WCAG2 A F17	Options ▾
⊘ ●	This page has markup errors, causing screen readers to miss content.	WCAG2 A F70	Options ▾
⊘ ●	Use the LANG attribute to identify the language of the page.	WCAG2 A 3.1.1	Options ▾
⊘	8 issues on 24 pages		

Figure 4-24: A Typical *SortSite* Accessibility Violation Report

While considerable attention has been paid to the discrepancy between automated, manual and user testing results, it is important to note that automated testing usually provides other benefits beside strict accessibility violations. One of these is the reporting available to users. For instance, *SortSite* is able to provide a detailed description of the *WCAG 2.0* success criteria, as shown in Figure 4-24. Such detailed reports enable easy location of errors so that they may be verified manually or located easily for remediation.

For each of these *SortSite* violations, an evaluator is able to expand itemised descriptions by using the drop-down arrow on the left which provides the URI for the page(s) where the violations occur.

Due to the size of the data tables, the individual website results are provided in Appendices 4-9 to 4-14. The summarised results for the categories are provided in the following sub-sections.

4.4.3.1 FEDERAL GOVERNMENT RESULTS

The summarised results for the federal government automated tests are provided in Appendix 4-9.

Separating out Automated tests #2 and #7 demonstrates the significant increase in the percentages of pages with accessibility violations from the beginning of the data collection period and its end. The summarised results for each category for all automated tests between #2 and #7 are available in Table 4-30. That table shows that, for some websites, there were wide fluctuations in scores generated by the automated testing throughout the six evaluations.

It is noteworthy, looking ahead to Figure 4-27, that every federal government website showed an increase in accessibility violations over the data collection period, many of them increasing by more than 50%. Website FD13 is shown as one of the websites which had the greatest increase in accessibility violations, approximately doubling in its adjusted means from 8.6% of pages with accessibility violations to 16.39%. This website was ranked fourth lowest in manual Evaluation #2 and was the lowest ranked site in the user testing.

Category	Benchmark against sites	All
Overall Quality	550 pages with quality issues	☑ better than average
Errors	25 pages with broken links or other errors	☑ better than average
Accessibility	164 pages with accessibility problems	☑ better than average
Compatibility	101 pages with browser specific issues	☑ better than average
Compliance	12 pages with compliance or legal issues	☑ better than average
Search	106 pages with search engine issues	☑ better than average
Standards	410 pages have W3C standards issues	☑ better than average
Usability	91 pages with usability issues	☑ better than average
Totals	1908 pages and files checked	

Figure 4-25: Automated Evaluation #2 for Website FD13

Figure 4-25 depicts the Automated #2 evaluation of FD13. If the Accessibility tab in Figure 4-25 is expanded, it provides the detail that the tool identified sixty-eight different issues, of which fifty-four were Level A violations. Of these, five were related to the use of pointer-specific handlers without equivalent keyboard handlers. This means that any keyboard-only user would not be likely to be able to operate these controls. It also shows that there were animated images, of more than five seconds' duration, that could not be paused or

stopped and Flash movies lacking pause or stop controls. It also provides information about the use of absolute CSS positioning, which could make pages unreadable if a user needed to turn the style sheets off. In

Figure 4-26 the *SortSite* dashboard for Automated #7 for the same website is provided.

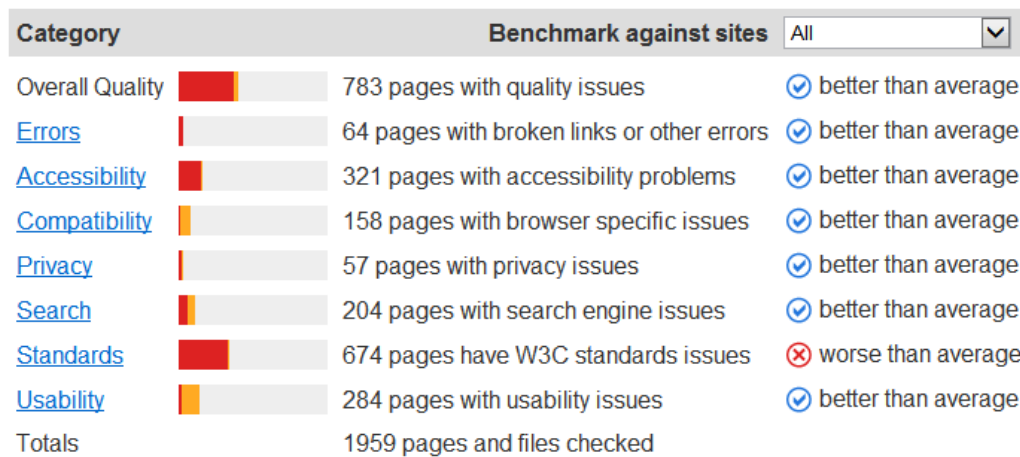


Figure 4-26: Automated Evaluation #7 for Website FD13

Expanding the Accessibility tab in the dashboard depicted in Figure 4-26 showed that a total of fifty-seven different issues had now been identified by the automated tool, of which fifty-one were Level A violations. While the number of pages with accessibility violations increased dramatically between Evaluations #2 and #7, the number of types of issues decreased from sixty-eight to fifty-seven.

The manual evaluation for this website also reveals a deterioration of accessibility with the mean errors per page increasing from 25.4 in Evaluation #1 to 30.2 in Evaluation #2. FD13 was ranked as 66 in Evaluation #1, dropping to rank 85 of 138 websites in Evaluation #2. The increase in violations shown in the manual evaluation was due to a number of issues, but colour contrast and images without alternative content were predominant. The change in colour contrast issues indicates that the web pages assessed had undergone design changes since Evaluation #2. It is surprising that redevelopment of federal government website would result in more issues in the light of the *NTS* and the emphasis placed on accessibility by the federal government.

Another anomaly may be observed in the results of website FD1, for which the adjusted means increased from 1.5% to 3.32% of the pages evaluated by automated testing. In the manual evaluations, this website ranked 118 in Evaluation #1 and 122 in Evaluation #2. While the violations increased, as they did during the automated testing, this website was the best-performing of the federal government websites in the

automated testing. These results are discussed in more detail in the section entitled *Comparison of Testing Results*, below.

Figure 4-27 shows the increase in accessibility violations for the federal government websites overall between automated Evaluations #2 and #7.

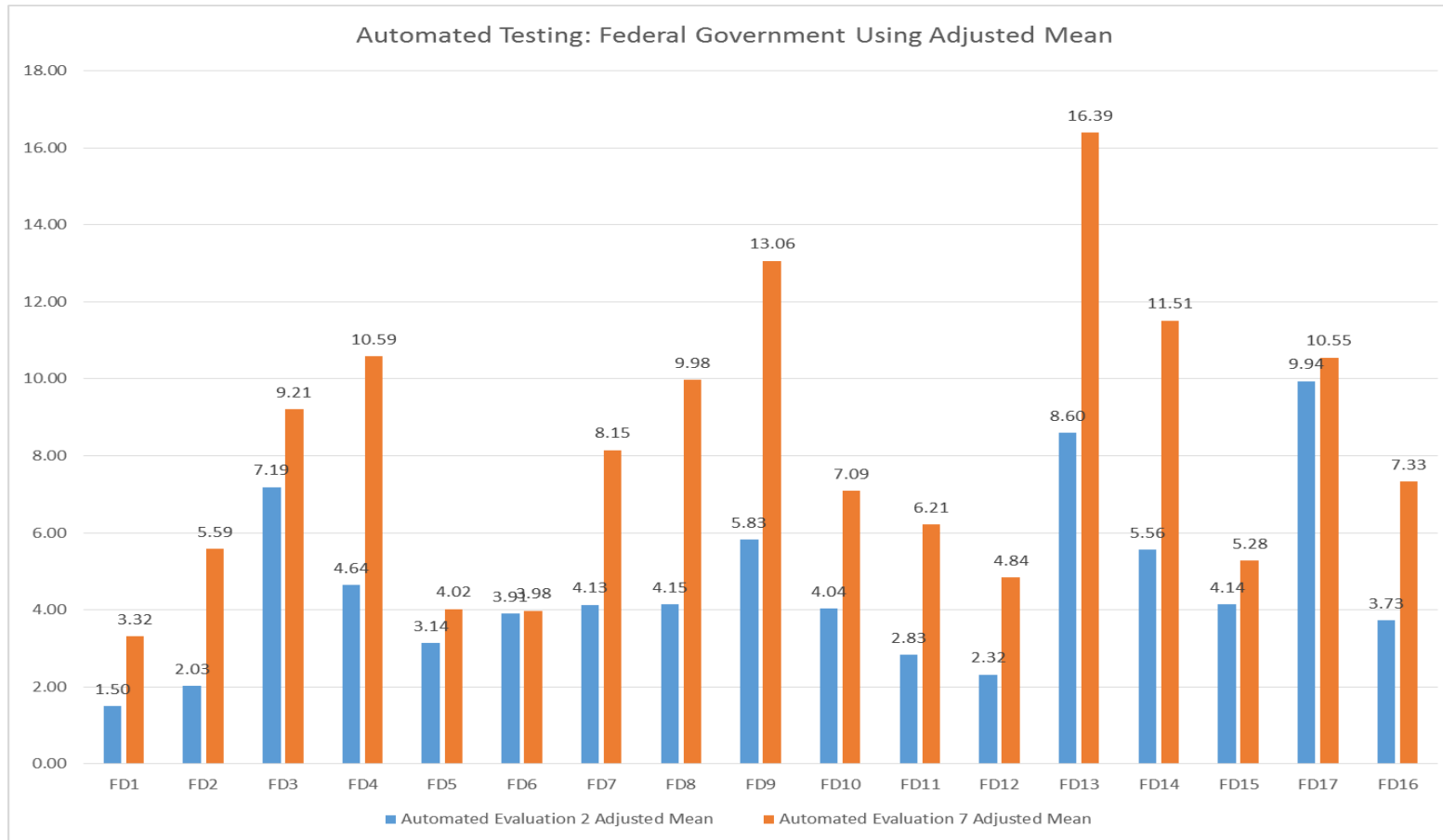


Figure 4-27: Automated testing results, using adjusted means, for Federal Government Evaluations #2 and #7

4.4.3.2 NOT-FOR-PROFIT RESULTS

Results for the federal government category were not duplicated by those of the not-for-profit category, which are summarised in Appendix 4-10. While five of the nine websites improved, both NFP5 and NFP7 improved dramatically, which led to an overall improvement for the category. NFP2’s accessibility violations doubled between the two assessments. However, the category’s starting rate was significantly lower than the other websites and its last evaluation demonstrated that its standing was analogous to those of the other categories. There is also significantly fewer variations in individual results in the Automated #7 valuation than in Automated #2.

Comparing the automated testing results for NFP5 and NFP7 with the manual testing results demonstrated that NFP5 showed a dramatic improvement in the understandable category while NFP7 showed a similar level of improvement in the robust category. This demonstrated that their developers are working towards solving accessibility problems and that the resulting improvements are not due to abnormalities or errors in the testing processes.

Figures 4-28 and 4-29 demonstrate the improvement shown by the automated evaluations #2 and #7 for NFP5. It may be seen that not only did its accessibility violations decrease, but that a number of other issues, such as broken links, search engine compatibility and browser compatibility, improved considerably.

Category	Benchmark against sites	All
Overall Quality	275 pages with quality issues	✔ better than average
Errors	78 pages with broken links or other errors	✘ worse than average
Accessibility	241 pages with accessibility problems	✘ worse than average
Compatibility	208 pages with browser specific issues	✘ worse than average
Compliance	1 pages with compliance or legal issues	✔ better than average
Search	189 pages with search engine issues	✔ better than average
Standards	186 pages have W3C standards issues	✔ better than average
Usability	191 pages with usability issues	✔ better than average
Totals	967 pages and files checked	

Figure 4-28: SortSite Dashboard: NFP5 Evaluation #2


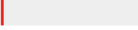
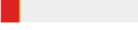
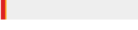
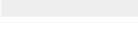
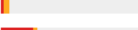
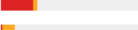
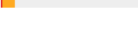
Category	Benchmark against sites	All
Overall Quality	 240 pages with quality issues	✓ better than average
Errors	 11 pages with broken links or other errors	✓ better than average
Accessibility	 87 pages with accessibility problems	✓ better than average
Compatibility	 24 pages with browser specific issues	✓ better than average
Privacy	 0 pages with privacy issues	✓ better than average
Search	 34 pages with search engine issues	✓ better than average
Standards	 161 pages have W3C standards issues	✓ better than average
Usability	 54 pages with usability issues	✓ better than average
Totals	613 pages and files checked	

Figure 4-29: SortSite Dashboard: NFP5 Evaluation #7

The automated evaluation results showing the improvement in NFP5 do not reflect its overall manual evaluation results, where the average violations per page increased only slightly from 31 to 31.4. Some of the individual pages assessed in the manual evaluations improved slightly, while others deteriorated slightly, leading to relatively static average page scores between the two evaluations.

The difference in the automated and manual evaluation results may partly be due to the fact that the automated tool considered all 613 pages of this website, as there were less than the total limit of 2000 pages set for the tool. This was offset by the manual valuation page count of five pages assessed. The difference would also be partially due to the inability of automated tools to check all of the WCAG 2.0 success criteria. In addition, the manual testing counted every violation and then averaged them to the number of pages checked. Using the adjusted means for the automated tool worked in the same manner, considering the eighty-seven pages with accessibility problems, shown in Figure 4-29, and dividing this figure by the 613 pages checked.

4.4.3.3 STATE GOVERNMENT RESULTS

The automated testing results for the state government websites are summarised in Appendix 4-11.

In some cases, during the running of the automated tests, there was a problem with either the website or the tool in processing the data. Sometimes this was caused by robots not being permitted to crawl the website. In the state government category data shown in Appendix 4-11, websites SG4 and SG41 are absent because of incomplete data.

The adjusted mean in automated testing for the category decreased from 13.2 in automated Evaluation #2 to 9.87 in Evaluation #7.

This is primarily due to substantial improvements in the results for three websites. By Evaluation #7, SG19, SG21 and SG22 had corrected the majority of the errors causing abnormal results to the point where the results were more consistent with the other websites in the state government category. This result is shown in Figure 4-30.

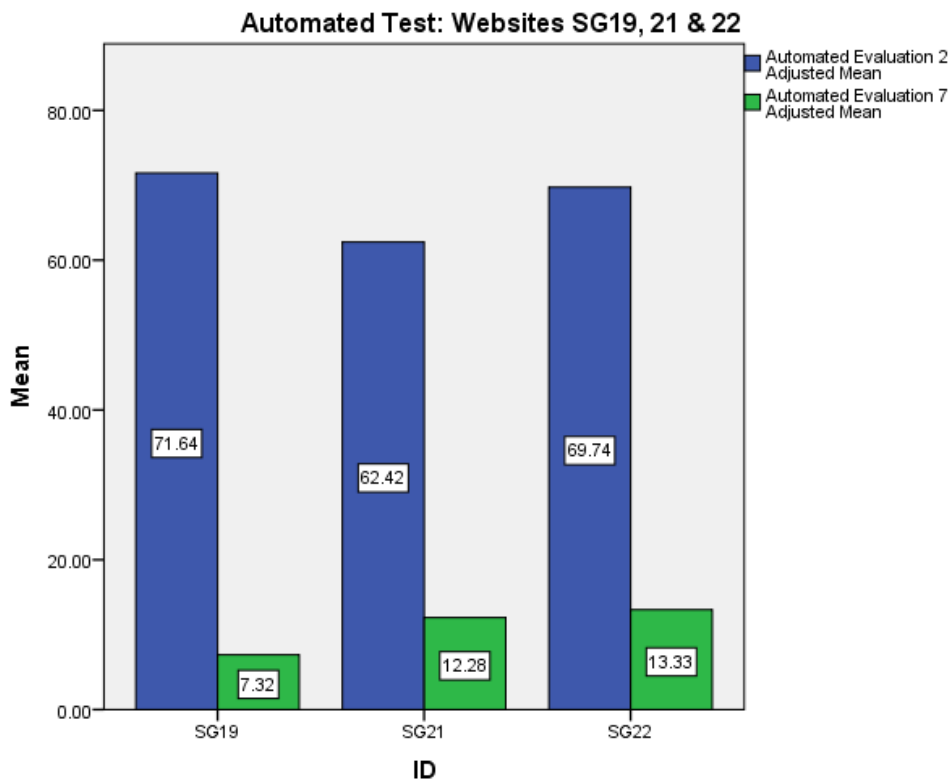


Figure 4-30: Automated Testing Results for SG19, SG21 and SG22

Figure 4-30 demonstrates that the largest improvement was that of SG19. Upon examination of the automated results it was found that in Automated #2 that 109 pages of 1972 had accessibility problems, which converted to an adjusted mean of 71.64. Reconsidering the manual evaluations, it is clear that the corrections have been made primarily in the perceivable and operable principles. Analysis shows that considerable improvement has been made in the structure of the headings and in the provision of alternate content for non-textual information. Colour contrast issues were also remedied to a large extent between the two manual evaluations. This is demonstrated in the *SortSite* dashboard in Figures 4-31 and 4-32.

Category	Benchmark against sites	All
Overall Quality		1603 pages with quality issues ⊗ worse than average
Errors		390 pages with broken links or other errors ⊗ worse than average
Accessibility		1407 pages with accessibility problems ⊗ worse than average
Compatibility		1291 pages with browser specific issues ⊗ worse than average
Compliance		65 pages with compliance or legal issues ⊙ better than average
Search		1390 pages with search engine issues ⊗ worse than average
Standards		1266 pages have W3C standards issues ⊗ worse than average
Usability		1438 pages with usability issues ⊗ worse than average
Totals		1964 pages and files checked

Figure 4-31: Automated Evaluation #2 for SG19

The results for the second automated evaluation (Figure 4-31) contrast very sharply with the seventh evaluation (Figure 4-32) for the same website. The accessibility violations decreased from 1407 out of 1964 pages with accessibility violations to 129 pages. The adjusted mean shows a decrease from 71.64% of 1964 pages with accessibility violations to 7.32%.

Category	Benchmark against sites	All
Overall Quality		396 pages with quality issues ⊙ better than average
Errors		59 pages with broken links or other errors ⊙ better than average
Accessibility		145 pages with accessibility problems ⊙ better than average
Compatibility		38 pages with browser specific issues ⊙ better than average
Compliance		6 pages with compliance or legal issues ⊙ better than average
Search		205 pages with search engine issues ⊙ better than average
Standards		122 pages have W3C standards issues ⊙ better than average
Usability		172 pages with usability issues ⊙ better than average
Totals		1980 pages and files checked

Figure 4-32: Automated Evaluation #7 for SG19

For SG19, the automated and manual results show considerable improvements in the accessibility violations. The mean accessibility violations per page decreased from 40.6 to 24.6 between Evaluation #1 & #2.

As demonstrated, just three of the forty-two websites in the state government category account for the improvement of the automated testing for the category as a whole.

4.4.3.4 LOCAL GOVERNMENT RESULTS

The automated testing results for local government are provided in Appendix 4-12, where five of the twelve websites demonstrate an increase in accessibility violations when assessed with the automated tool. This change resulted in a slight increase in the adjusted mean for the category from 9.76 in Evaluation #1 to 10.04 in Evaluation #2.

There is little correlation between the results for the automated and the manual testing in terms of relative rank positions. In the automated tests, LG1 is shown to have the highest overall violations across the two evaluations with a score of 13.01 in Evaluation #1, decreasing slightly to 12.12 in Evaluation #7. However, in the manual results the violations decrease significantly from Evaluation #1 to Evaluation #2.

In the automated tests, LG12 had an adjusted mean of 11.12 in Evaluation #2, decreasing to 9.79 in Evaluation #7. However, looking at Figure 4-33, the dashboard for the automated tool, it would at first appear that the results had deteriorated considerably.

Category	Benchmark against sites	All
Overall Quality	405 pages with quality issues	☑ better than average
Errors	238 pages with broken links or other errors	☒ worse than average
Accessibility	142 pages with accessibility problems	☑ better than average
Compatibility	76 pages with browser specific issues	☑ better than average
Compliance	8 pages with compliance or legal issues	☑ better than average
Search	95 pages with search engine issues	☑ better than average
Standards	126 pages have W3C standards issues	☑ better than average
Usability	144 pages with usability issues	☑ better than average
Totals	1277 pages and files checked	

Figure 4-33: Automated evaluation #2: LG12

Figure 4-33 indicates 142 accessibility errors which equates to 11.2% of pages having accessibility violations for the adjusted mean due to a lower number of pages.

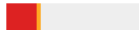
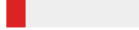
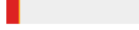
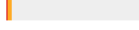
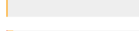
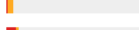
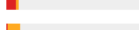
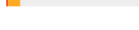
Category	Benchmark against sites	All
Overall Quality	 505 pages with quality issues	✔ better than average
Errors	 287 pages with broken links or other errors	✘ worse than average
Accessibility	 195 pages with accessibility problems	✔ better than average
Compatibility	 80 pages with browser specific issues	✔ better than average
Privacy	 6 pages with privacy issues	✔ better than average
Search	 85 pages with search engine issues	✔ better than average
Standards	 186 pages have W3C standards issues	✔ better than average
Usability	 201 pages with usability issues	✔ better than average
Totals	1991 pages and files checked	

Figure 4-34: Automated evaluation #7: LG12

As shown in Figure 4-34, by the time automated Evaluation #7 took place the number of pages in the site had increased to the maximum page count and the adjusted mean had decreased to 9.79%, even though the number of pages with accessibility violations had increased from 142 to 287. This confirms the importance of using the adjusted mean so that appropriate comparisons may be made.

When looking at the manual evaluations for this website, there was an increase in accessibility violations from an average of 20 in Evaluation #1 across the five pages to an average of 23.2 in Evaluation #2. These changes were mainly due to improperly described links and the presence of generic link texts such as “read more.” This issue was traced by the automated tool, which reflected an increased number of pages with accessibility violations.

4.4.3.5 CORPORATE RESULTS

It can be seen in Appendix 4-13, where the corporate automated results are summarised, that some of the data is missing for the websites that, for various reasons, could not be crawled by the automated tool. Website COR33, while having a significantly higher average number of pages with accessibility violations, demonstrated very little change between Evaluations #2 and #7, as shown in Table 4-36, below.

Table 4-36: Automated Testing Corporate Category

Website	Automated Evaluation #2 Adjusted Mean	Automated Evaluation #7 Adjusted Mean
Mean	11.99 (SD=7.58)	12.75 (SD=7.56)
COR33	34.04	33.8
COR5	5.65	7.29

There is a disparity between the relative positions of the websites in the corporate category between the automatic and manual evaluations. The extremely high rating for COR5 in the second manual evaluation is dissimilar to the rating in the automated testing. COR33 demonstrates extremely high violation counts in the automated testing, which is not reflected in the manual testing, where it is actually one of the better-scoring websites in the Manual POUR evaluation.

Website COR2 is mentioned below in the discussion of the comparison of testing results. It was one of the websites where there was a disparity in the ratings between the different testing methods. COR2 had extensive multimedia features without captions or text transcripts. The listing of accessibility violations in Figure 4-23 demonstrates no specific mention of multimedia without captions or text transcripts, which is a problem that must be identified manually.

- ⌵ ● All FIELDSET tags should be labeled with LEGEND tags.
- ⌵ ● An ACCESSKEY attribute is not unique.
- ⌵ ● Decorative or spacer image has a non-blank ALT attribute.
- ⌵ ● Each A tag must contain text or an IMG with an ALT tag.
- ⌵ ● EMBED tags must have a non-blank ALT tag.
- ⌵ ● EMBED tags must have an associated NOEMBED tag.
- ⌵ ● IFRAME tags must have alternative content.
- ⌵ ● IMG ALT text must not be the same as the image file name.
- ⌵ ● IMG ALT text should not contain placeholder text like 'picture' or 'spacer'.
- ⌵ ● IMG tags must have an ALT attribute.
- ⌵ ● No TITLE attributes found for the frames on these pages.
- ⌵ ● OBJECT tags should contain alternative content.
- ⌵ ● Some pages have the same title, so the title cannot be used to distinguish pages.
- ⌵ ● The ALT text of this image mentions a color, which isn't useful for blind users.
- ⌵ ● This form control has no associated LABEL element.
- ⌵ ● This LABEL refers to a non-existent control.
- ⌵ ● This link uses general text like "Click Here" and has no surrounding text to make the context clear.
- ⌵ ● This page has duplicate IDs which cause problems in screen readers.
- ⌵ ● This page has markup errors, causing screen readers to miss content.
- ⌵ ● Use HTML headings tags instead of applying CSS heading styles to non-headings.
- ⌵ ● Using ALT text which duplicates link text in the same link or the following link results in screen readers stuttering as the same text is read out twice.
- ⌵ ● Headings should not be empty.
- ⌵ ● Text-based form controls with absolute font sizes do not resize correctly.
- ⌵ ● Use relative rather than absolute units in CSS property values.
- ⌵ 24 issues on 103 pages

Figure 4-35: SortSite Accessibility Issues: COR2

Figure 4-35 displays the listing of accessibility violations for website COR2. The red dots are Level A, while the yellow dots are Level AA violations. While the automated results ranked this website at 11, the manual evaluation ranked it at 100 and the user testers ranked it at 82. These differences are due to the types of violations and the fact that they may not be identified by an automated tool.

The SortSite dashboard for COR2 is shown in Figure 4-36 which enables a view of the “better than average” rating applied because of the relatively low number of errors located in the 2000 pages assessed.

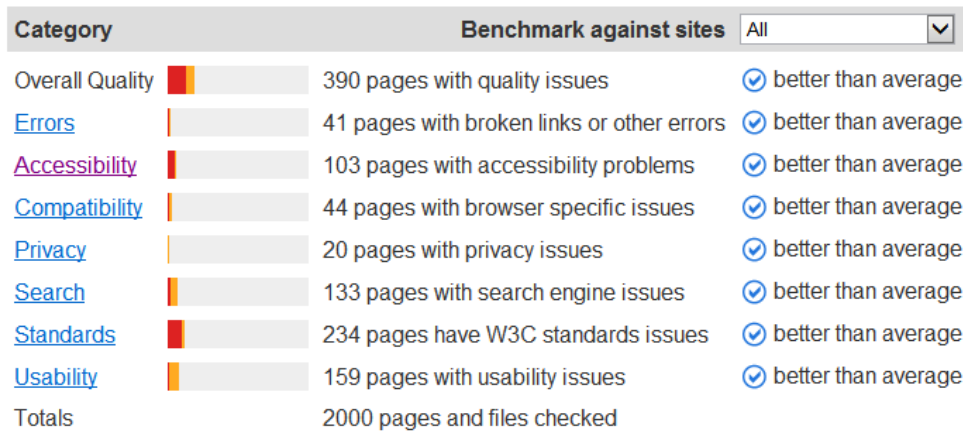


Figure 4-36: SortSite Dashboard for COR2

Figure 4-36 also demonstrates the features provided by *SortSite* in addition to its ability to check website accessibility. This figure demonstrates the usefulness of automated testing and some of the parallel uses of the tool. Further discussion of the critical importance of testing methods is provided in Chapter 6.

4.4.3.6 GOVERNMENT-AFFILIATED RESULTS

The summarised results for the government-affiliated category are included in Appendix 4-14. There were no substantial changes in the results for this category between Evaluations #2 and #7, with the exception of GA7 which demonstrated a substantial improvement. Six of the nine websites showed an increase in violations between Evaluations #2 and #7 with the largest increase in violations occurring in GA3, as demonstrated in Table 4-37.

Table 4-37: Automated Testing: Government-affiliated Category

Website	Automated Evaluation #2 Adjusted Mean	Automated Evaluation #7 Adjusted Mean
Mean	=11.99 (SD=7.58)	=12.75 (SD=7.56)
GA7	15.73	7.94
GA3	22.18	31.72

To highlight some of the results of the automated testing of GA7, the dashboard for the automated tests in Evaluations #2 and #7 have been provided in Figures 4-37 and 4-38.

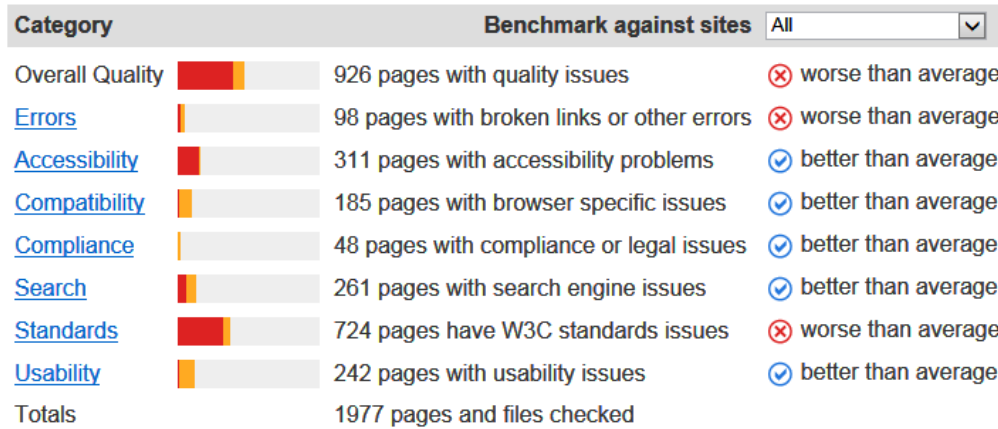


Figure 4-37: SortSite Evaluation #2: GA7

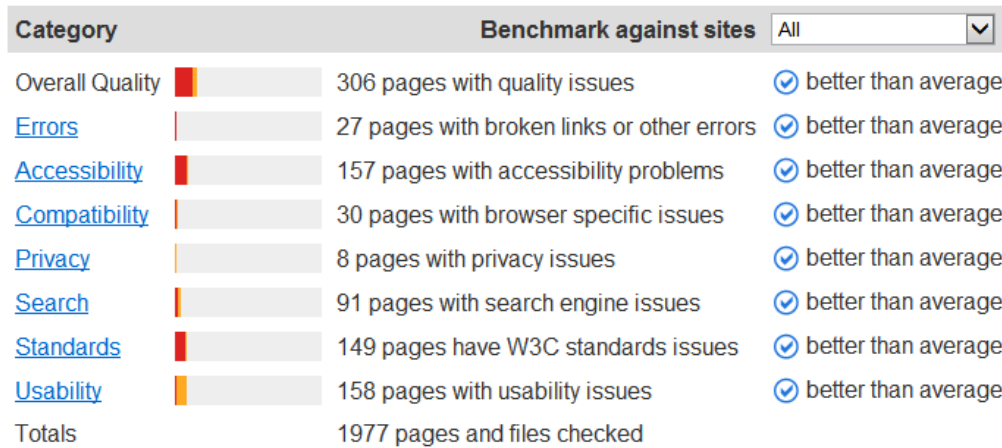


Figure 4-38: SortSite Evaluation #7: GA7

The accessibility violations were approximately halved from 311 to 157 between Evaluations #2 and #7. One of the main benefits of SortSite is the other information provided for the evaluator. The number of pages with overall quality issues dropped from 926 to 306 over this period. Other quality issues, such as the number of

pages with broken links, which decreased from 98 to 27, compatibility with browsers and search engines also improved dramatically.

These issues are not likely to be highlighted in either a manual evaluation or with user testing, confirming the usefulness of automated tools which are able to crawl through large websites. Broken links are very much an issue of usability. The user testing team may identify broken links on the specific pages they visit, but would not be able to identify all the broken links occurring in a large website.

While considering the number of accessibility violations is important, the usefulness of automated tools is often in locating the URI and line number of the error. Tools such as *SortSite* also provide links to the relevant WCAG success criteria so that the reviewer can determine whether the issue has been successfully identified (Powermapper software, 2010).

4.5 COMPARISON OF TESTING RESULTS

In order to determine the reliability of the testing methods individually, a comparison was made of the different testing results: manual, automated, and user testing. FD4 performed best in the manual Evaluation #2, ranked 12 in the user testing, but 83 in the automated testing. NFP1 performed worst in the manual testing, ranked 126 in the user testing, but 47 in the automated testing. In both of these cases, it is the automated testing result that is most inconsistent.

Table 4-38 displays the best and worst performing websites in the manual testing with their respective rankings for user and automated testing.

Table 4-38: Comparison of Testing Results

Website	Manual Eval 2 Rank	User Rank	Automated Eval 7 Rank
Best Rank Manual			
FD4	1	12	83
FD12	2	22	9
SG15	2	2	35
LG1	4	6	104
COR13	5	30	2

COR28	6	39	12
SG39	7	15	39
FD11	8	1	19
FD16	9	15	82
NFP2	10	39	58
FD9	11	101	112
COR20	11	15	124
Worst Rank Manual			
COR23	126	101	90
NFP6	127	82	5
COR36	128	22	99
FD14	129	126	95
COR42	130	136	6
COR38	131	136	67
COR48	131	101	N/A
COR1	133	120	52
COR45	134	58	21
NFP1	135	101	83
NFP9	136	126	47
COR5	137	101	29

The rankings which have been shaded are most closely associated in order to determine where the similarities of testing results occurred. As can be seen, it is most often the automated testing results which differ. This

may be due to the pages selected for manual testing not being the same as those chosen by the automated testing, thereby producing different results, the automated testing missing errors, or the manual testing not correctly identifying errors. Differences between the manual and user testing results are most likely to be due to the users testing different pages or their testing reflecting usability issues which are not *WCAG 2.0* accessibility violations. An appropriate example might be the user testing preference for a single heading at H1 level and for headings to be correctly nested. This is not considered to be a *WCAG 2.0* violation.

When the results from automated and manual testing are compared, in some cases the automated testing ranked websites more highly than either the user or automated testing. One example displayed in Table 4-39 is FD1, which is the best-performing website in the automated testing, while in the manual testing it is among the worst-performing.

Table 4-39: Comparison of Automated to Manual Results

Website	Manual Eval 2 Rank	User Rank	Automated Eval 7 Rank
COR2	100	82	11
FD1	122	58	1
FD6	53	6	3

With Website FD1, the manual evaluation found a problem with links which gave only the date, which made understanding difficult. Eighty-one empty links, which the screen reader announced as “link,” were also identified. Although this problem with links was identified by the automated tool, due to the size of the website the impact of the issue was distributed among all of the pages of this large website. In the manual evaluation, which assessed only five pages, it had an increased impact.

In the manual evaluation for COR2, the manual evaluation located a large number of videos which had no captions or text transcripts. This was discussed in a previous section presenting the corporate results.

5 SURVEYS

5.1 INTRODUCTION TO SURVEY DATA

Three surveys were conducted, one at the beginning, one at the mid-point, and one at the end of the data collection period. The questions were substantially the same for all surveys with only minor changes made to reflect changes in research requirements. For example, the question about PDF documents was altered to reflect the introduction of sufficient techniques in *WCAG 2.0* for PDF documents. However, it was noted that in Australia, AGIMO, which developed the *National Transition Strategy* (Australian Government, 2013c; Australian Government Information Management Office (AGIMO), 2010b; vanTeulingen, 2014) continues to require that a more accessible alternative be placed with every PDF document, as discussed in Chapter 4. This requirement was reflected in a penalty imposition that was discussed at length in Chapter 4.

The link to the online survey was sent to every owner of the 138 websites in the research sample. The survey itself was divided into sections:

- Demographic information including identification numbers which had been provided in separate emails;
- Organisation-specific website accessibility awareness;
- Current website accessibility compliance;
- Accessibility development;
- Technical website accessibility issues;
- General website accessibility issues;
- Organisation-specific issues; and
- Feedback information contact details.

The full survey text is provided in Appendix 4-22. The following section provides the results from the three surveys. The information gathered by the surveys was useful in answering the supporting questions of this research.

5.2 SURVEY RESULTS

As discussed in Chapter 3.2.5, a survey was sent to a contact person identified for each of the 138 websites. In the first survey, respondents began 47 surveys but only 30 were completed, in the second 27 were begun and 19 completed, while in the third 28 were begun with 17 completed. The number of questions answered in the incomplete surveys varied. Five of the survey respondents answered all three surveys. Of these, two represented federal government departments, FD3 and FD8, one represented a state government department, SG40, one represented a local government authority, LG3, and one represented a not-for-profit website, NFP2. The majority of the respondents replied on behalf of federal and state government departments. Very few responses were received from the corporate sector.

In an effort to determine if the fact that an organisation answered all three surveys indicated its commitment to accessibility, rankings from the manual evaluations are tabulated below.

Table 5-1: Rankings for websites which answered all three surveys

ID	Manual Evaluation #1 Rank	Manual Evaluation #2 Rank
FD3	14	13
FD8	26	30
SG40	118	109
LG3	29	43
NFP2	2	8

It might have been hypothesised that the organisations which appeared to be most interested in the subject of website accessibility might have invested more resources in making their websites accessible. However, it may be seen from Table 5-1 that there was little association between the accessibility of the websites whether their manual evaluation results improved or whether the organisation answered all three surveys. There were 138 websites in the group, but only one of the five organisations which answered all surveys fell among the lowest scoring websites in the manual evaluation. FD3 and FD8 are among the best-performing federal websites, while SG40 is close to being the worst-performing of the state government websites. LG3 was one of the better-performing of the local government websites, but its score deteriorated between the two evaluations. NFP2 was by far the best-performing of the not-for-profit websites as demonstrated in Figure 4-53 in Chapter 4.

It is necessary to break down responses by category in order to determine if they reflected the composition of the target sample.

Table 5-2: Ownership/management category

Category	Survey 1		Survey 2		Survey 3	
	# of respondents	Percent of respondents	#	Percent of respondents	#	Percent of respondents
Federal Government	10	21%	8	32%	7	25%
State Government	21	45%	7	28%	10	36%
Local Government	4	9%	4	16%	4	14%
Government-Affiliated	3	6%	3	12%	1	4%
Not-For-Profit	3	6%	3	12%	5	18%
Corporate	6	13%	0	0%	1	4%
	47		25		28	

Table 5-2 demonstrates that, while the percentages of participation between the categories varied considerably over the surveys, the largest number of respondents came from government organisations. This is understandable, considering the added impetus imposed by the *NTS*. Table 4-3 in Chapter 4 reported that government and government-affiliated websites made up 58.7% of the total sample group with the remaining 41.3% coming from corporate and not-for-profit organisations. In survey 1, thirty-eight or 81% of the respondents were from government organisations, as were twenty-two or 88% in survey 2 and twenty-two or 79% in survey 3. These percentages would appear to indicate a greater interest in the results of the research by government organisations, probably because they are facing scrutiny under the *NTS*. While the surveys were sent to the same person each time, there is no guarantee that the same person answered each survey. It is possible that some recipients passed the survey to co-workers and, in some cases, there may have been staff changes during the data collection period.

The researcher asked about the clients or user bases of the websites being surveyed. 83% of the respondents understood that combinations of senior citizens, young families and single adults made up their website user

bases. Only ten respondents of the ninety-nine who answered this question selected “other,” with the predominant responses indicating their user bases were largely made up of government employees and other businesses.

In order to understand the level of awareness of Australian requirements, *NTS* and *WCAG*, and to determine whether organisations had commenced the accessibility checking of their websites, the researcher asked a number of related questions and responses to those questions are reflected in the statistical tables below. While some of the questions used a Likert scale with a range of possible responses from “strongly disagree” to “strongly agree,” open-ended questions were also included to allow respondents to express opinions.

Table 5-3: Survey cross tabulation of category and effect of *NTS*

Statement: The <i>NTS</i> has had little effect on our efforts to achieve <i>WCAG 2.0</i> compliance.								
Category	Survey		Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
Federal Government	Survey	1			1	5	1	7
		2			2	1	2	5
		3			2	1	5	8
	Total			5	7	8	20	
State or Territory Government	Survey	1	0	0	7	1	0	8
		2	2	1	1	0	0	4
		3	0	0	3	0	1	4
	Total		2	1	11	1	1	16
Local Government	Survey	1	0	0	1	0		1
		2	0	1	0	1		2
		3	1	0	0	0		1
	Total		1	1	1	1		4
Government-Affiliated	Survey	1	1	1	0			2
		2	0	0	1			1
	Total		1	1	1			3
Not-For-Profit Organisation	Survey	1	2					2
	Total		2					2
Commercial Organisation	Survey	1	1					1
	Total		1					1
Total	Survey	1	4	1	9	6	1	21
		2	2	2	4	2	2	12
		3	1	0	5	1	6	13
	Total		7	3	18	9	9	46

Table 5-3 indicates very strongly that managers of the federal government websites reported that the *NTS* had strong effected their efforts to achieve *WCAG 2.0* conformance, while respondents from the not-for-profit and corporate categories agreed that the *NTS* had little effect on their efforts to achieve compliance. Any expectations that there would be a flow-on effect from the publicity surrounding the *NTS* were not supported

by the responses to this question. State government respondents chiefly indicated that they neither agreed nor disagreed with the statement. Indeed, the greatest number of respondents, apart from the federal government respondents, neither agreed nor disagreed with the statement.

Figures 5-1, 5-2 and 5-3 depict graphically responses to the various questions dealing with understanding of the Australian Government's requirements and knowledge of WCAG 2.0. These figures illustrate the results of the cross-tabulation of respondents who agreed with the various statements, those who disagreed, and those who neither agreed nor disagreed.

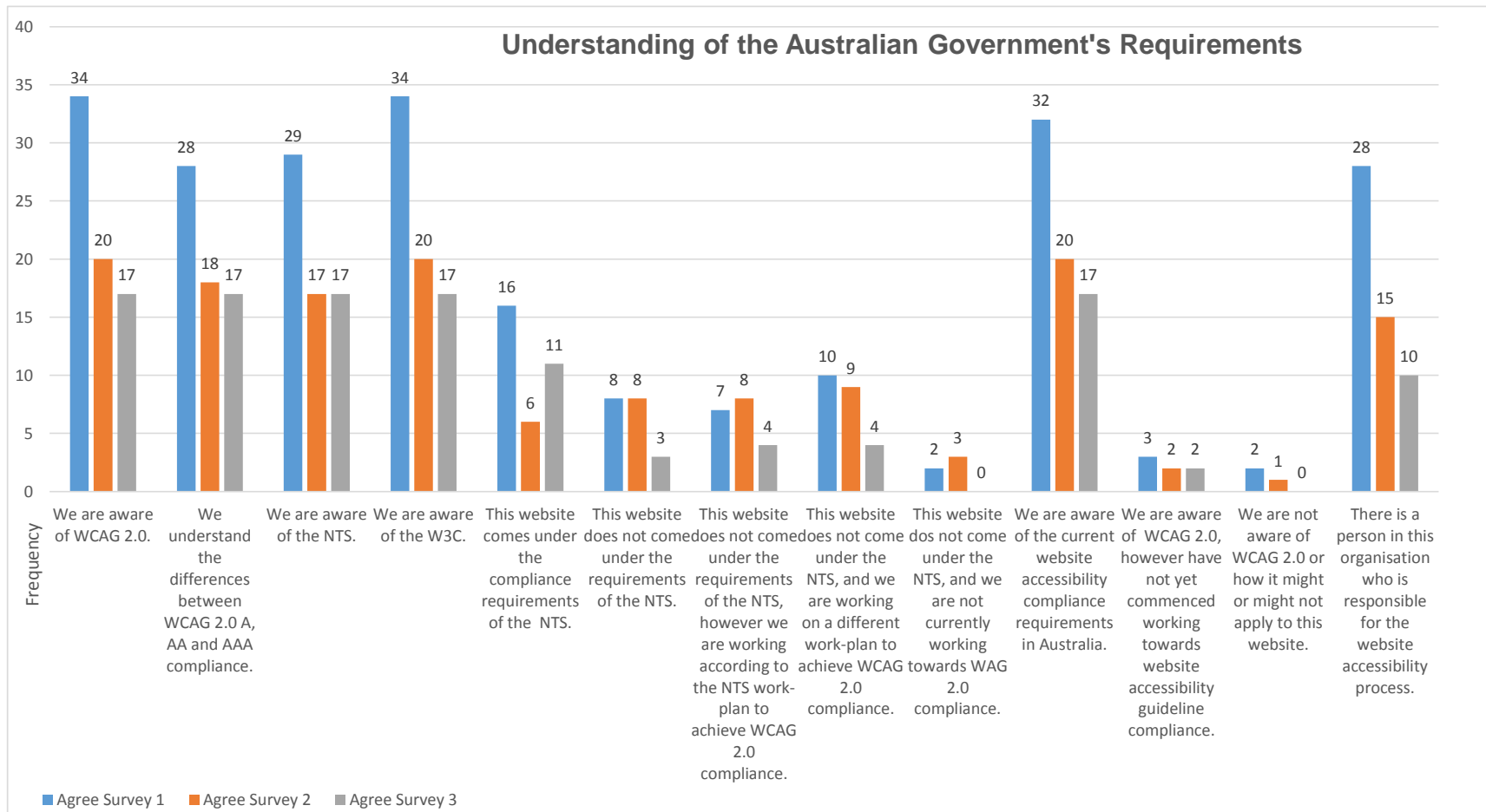


Figure 5-1: Understanding of the Australian Government's requirements - Agreement

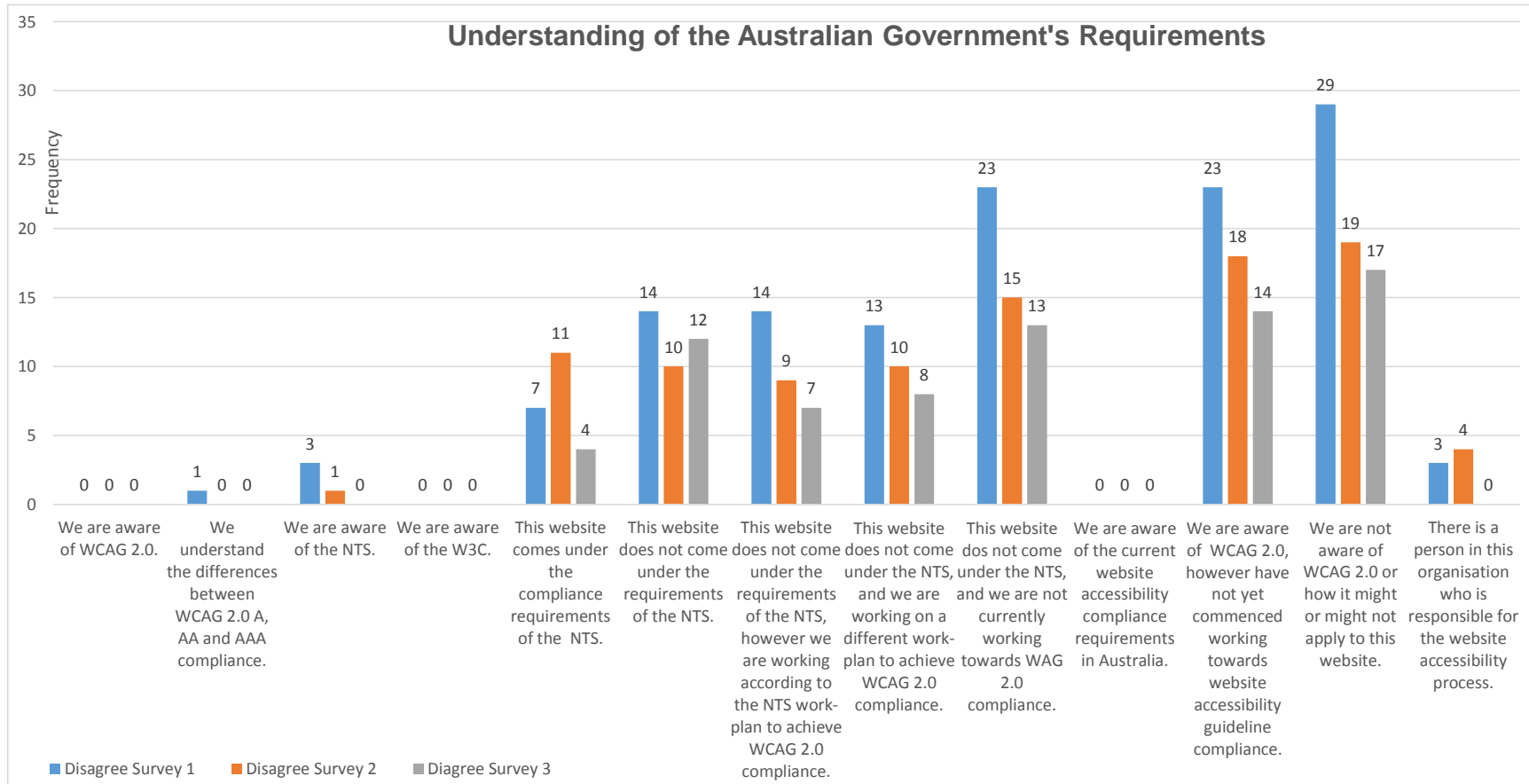


Figure 5-2: Understanding of the Australian Government's Requirements - Disagreement

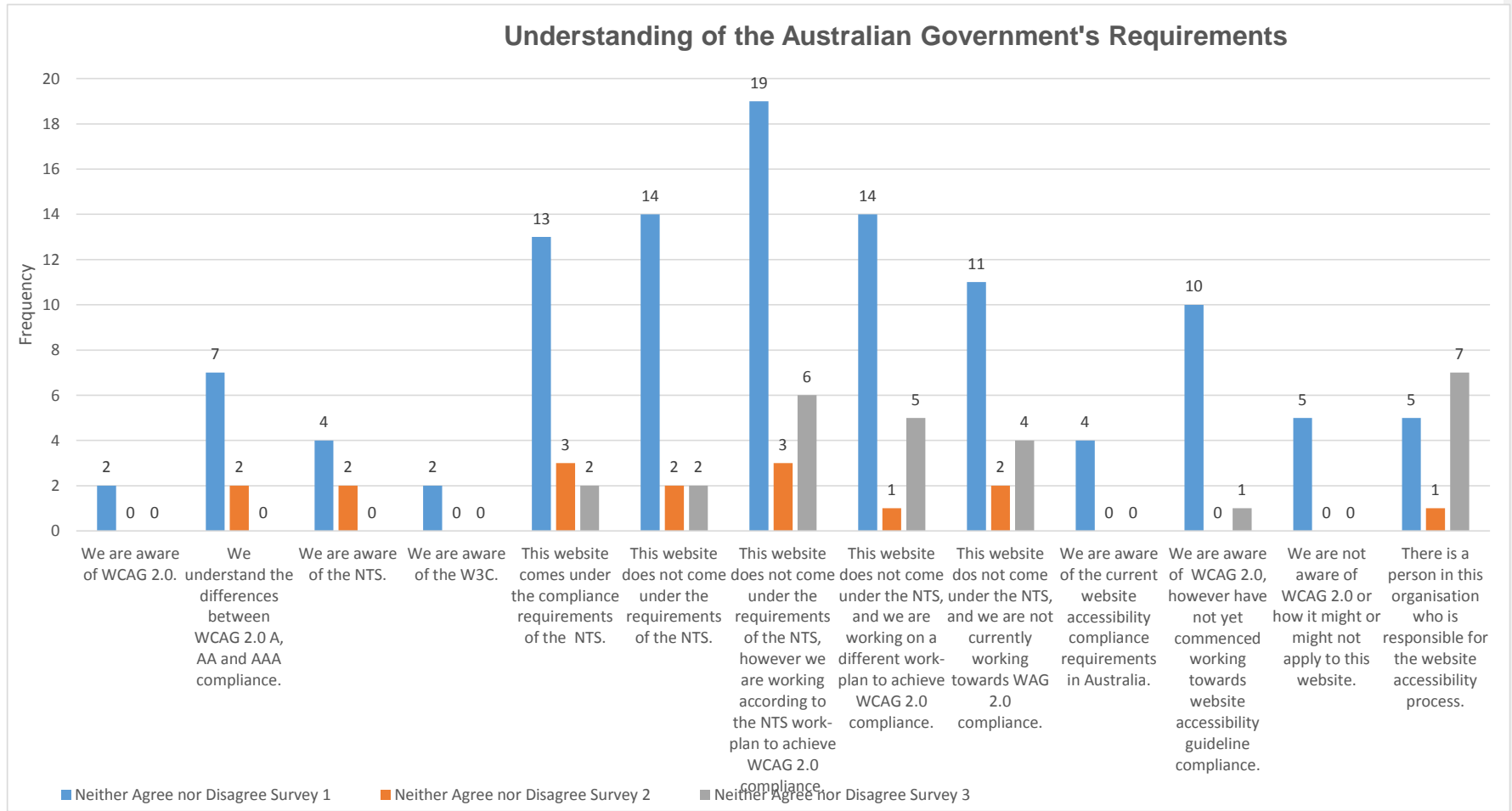


Figure 5-3: Understanding of the Australian Government's Requirements - Neither agree nor disagree

The majority of the respondents for each survey were government agencies of some type, which is reflected in the results. For instance, in survey one, thirty-four of the respondents agreed they were aware of *WCAG 2.0* while thirty-eight of the respondents were government agencies. In survey two, twenty of the respondents were aware of *WCAG 2.0* and twenty-two of the respondents were government agencies, while in survey three, seventeen respondents were aware of *WCAG 2.0* and twenty-two of the respondents were government agencies.

The last of this group of questions asked whether there was a person in the organisation who had responsibility for the website accessibility process. According to the responses over the three surveys, the staffing of the website accessibility process appears to be diminishing. This may be an indication that, after the initial emphasis upon accessibility, particularly for the federal government websites, resourcing for ensuring the websites achieve *WCAG 2.0* compliance is actually being reduced. In December 2013, the Department of Finance produced its *2012 Progress Report on the NTS*. This document stated that “More than a third of agencies report having a dedicated resource whose primary role is accessibility; in 2010 there were none.” (Australian Government, 2013b). This appears to contradict the findings of this research, but it should be kept in mind that the Department of Finance report surveyed all federal government agencies, not just the seventeen questioned in this study.

Table 5-4: Survey cross tabulation with category and person responsible for website accessibility

Statement: There is a person in this organisation who is responsible for the website accessibility process							
Category	Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
Federal Government	1	5	4	0		0	9
	Survey 2	2	2	1		1	6
	3	4	0	4		0	8
	Total	11	6	5		1	23
State/Territory Government	1	8	3	4	1		16
	Survey 2	1	3	0	1		5
	3	2	3	2	0		7
	Total	11	9	6	2		28
Local Government	1	2	1		0		3
	Survey 2	2	0		2		4
	3	1	0		0		1
	Total	5	1		2		8
Government-Affiliated	1	2	1	0			3
	Survey 2	1	1	0			2
	3	0	0	1			1
	Total	3	2	1			6
Not-For-Profit Organisation	1	2	0		1		3
	Survey 2	2	0		0		2
	3	0	1		0		1
	Total	4	1		1		6
Commercial Organisation	Survey 1			1	1		2
	Total			1	1		2
Total	1	19	9	5	3	0	36
	Survey 2	8	6	1	3	1	19
	3	7	4	7	0	0	18
	Total	34	19	13	6	1	73

Table 5-4 shows that, in survey one, all federal government respondents agreed that they had employed someone to be responsible specifically for the accessibility of the website. However, by survey three, only 50% agreed while 50% neither agreed nor disagreed. In the state government category, in survey one, eleven of sixteen respondents, or 69%, agreed they had someone in the role. However, by the conclusion of survey three, five of seven respondents or 71% indicated they had someone who was responsible for the website. In

the not-for-profit sector in surveys one and two, two organisations indicated someone occupied this role but by survey three, no organisations reported an incumbent responsible for the website's accessibility.

However, in order to explore the reasons for these results, the option was given in the following question to provide additional information that respondents might feel was pertinent. In the following statements, there is a possible reason for this diminishing result.

From survey one came a statement from respondent FD3:

We have a team of people who are responsible for directing the department toward accessibility compliance. We do not claim responsibility for the entire organisation, however, though we do have fairly stringent publishing requirements and update people throughout the department about the importance of compliance. We generally have trouble convincing management of the importance of the issue, even though we have had some legal problems.

In survey two respondent FD2 indicated "Accessibility compliance is not the responsibility of a single person, it tends to be built into requirements, development and review processes."

In survey three, respondent COR29 stated

There is no one person responsible for accessibility, nor has there been any solid direction regarding a way to address accessibility of content, within our organisation. It has been a dual effort between our web team and our communications team.

Two of these three responses came from federal government and one from the corporate category. If these responses are indicative of the situation, they might mean that organisations are now placing the responsibility for their websites upon all employees who work with the website rather than upon individuals. An initial requirement to have someone specifically commissioned with the job of making sure content was accessible may have evolved to become a shared responsibility among a team.

One of the supporting research questions asks "What are the obstacles faced by organisations in achieving mandated website accessibility compliance." In order to find some answers to this question, the researcher asked the survey respondents "What do you see as the most critical issues relating to website accessibility for your organisation?" The qualitative comments were grouped and cross-tabulated with the categories and survey numbers and are provided in Table 5-6.

Table 5-5: Cross-tabulation of most critical issue for organisation, category and survey

Most critical issue for your organisation							
Category	Survey	Working with documents and document creators	Organisational Understanding and Resourcing	Technical including browsers and CMS	Nature of the content	Internal capability	Total
Federal Government	1	1	3	1	4	0	9
	Survey 2	0	2	0	2	2	6
	3	0	4	1	2	1	8
	Total	1	9	2	8	3	23
State or Territory Government	1		5	2	6	0	13
	Survey 2		2	0	1	1	4
	3		3	1	3	0	7
	Total		10	3	10	1	24
Local Government	1		1	1	1	0	3
	Survey 2		1	1	2	0	4
	3		0	0	1	1	2
	Total		2	2	4	1	9
Government-Affiliated	1			1	1		2
	Survey 2			1	1		2
	Total			2	2		4
Not-For-Profit Organisation	1		0	2	0		2
	Survey 2		2	0	0		2
	3		0	0	1		1
	Total		2	2	1		5
Total	1	1	9	7	12	0	29
	Survey 2	0	7	2	6	3	18
	3	0	7	2	7	2	18
	Total	1	23	11	25	5	65

Table 5-5 demonstrates that 77% of respondents mentioned either the nature of the content or organisational understanding and resourcing as issues. Only 8% of respondents stated that they did not have the internal capability to meet their requirements, while only 17% reported that the technical issues including browser support or content management systems were their most critical problems. In the federal government category, 39% of respondents stated that organisational understanding and resourcing was the most critical

issue. This corresponds to 42% of state government respondents. Due to the *NTS's* emphasis on the federal government, these figures are surprisingly high.

While respondents were asked about the most critical issues for their particular organisations in achieving *WCAG 2.0* compliance, they were also asked for the most critical issues relating to overall website accessibility in Australia. They were asked to take the emphasis off their own websites and look at the web industry in Australia as a whole. This also was an open-ended question designed to explore the issues a little more deeply.

Table 5-6: Cross-tabulation of most critical issues in Australia, category and survey

Most critical issues relating to website accessibility in Australia							
Category	Survey	Education of developers, users and management	Content including forms, legacy documents, PDF, etc.	Technical issues	Resourcing and management support	Other	Total
Federal Government	1	6	2	0	0	1	9
	Survey 2	2	2	1	1	0	6
	3	4	1	1	1	0	7
	Total	12	5	2	2	1	22
State/Territory Government	1	4	1	5	2	1	13
	Survey 2	1	0	0	1	1	3
	3	3	0	2	1	1	7
	Total	8	1	7	4	3	23
Local Government	1	0		1	1		2
	Survey 2	2		1	1		4
	3	1		0	0		1
	Total	3		2	2		7
Government-Affiliated	1	1			1		2
	Survey 2	1			0		1
	Total	2			1		3
Not-For-Profit Organisation	1	1		1	0		2
	Survey 2	1		0	1		2
	3	1		0	0		1
	Total	3		1	1		5
Total	1	12	3	7	4	2	28
	Survey 2	7	2	2	4	1	16
	3	9	1	3	2	1	16
	Total	28	6	12	10	4	60

Table 5-6 indicates that the issue seen by respondents as most critical is that of education for all parties including developers, users and management. This theme recurred throughout the surveys, respondents expressing concern about the level of organisational understanding, resourcing and education. 55% of federal government organisations expressed this concern compared with 35% of the state government category. Issues identified by respondents from other categories were too low to quantify. Technical issues were cited as most critical by 9% of federal government respondents, and by 30% of state government respondents.

While the federal government respondents expressed the most concern about education for developers, users and management, their state government counterparts reported that technical issues were of greater concern to them. Table 5-6 also indicates that state government respondents were more concerned about resourcing of accessibility functions.

Overall, 47% of respondents reported the most critical issue in Australia is education, while 20% stated that technical issues were most critical.

Survey respondents were asked specifically about the barriers they perceived in achieving WCAG 2.0 Level A compliance for their particular website. In the survey, Question 4.2 allowed the option of “all of the above named possible barriers” as well as allowing respondents to choose more than one barrier. The option of “other” was also included in case respondents experienced a barrier to achieving WCAG 2.0 compliance not named in the survey. While it might be argued that these provisions could skew the data, it was believed that respondents could legitimately argue that they had experienced all possible barriers. Conversely they might have experienced none of them, but found progress toward accessibility hampered by a completely different barrier that they would list under the “other” option.

Table 5-7: Barriers in complying with WCAG 2.0

#	Answer	Survey 1		Survey 2		Survey 3	
		Response	%	Response	%	Response	%
1	Time	18	62%	8	44%	9	56%
2	Cost/budget	17	59%	8	44%	10	63%
3	Technical ability	12	41%	4	22%	4	25%
4	Management support	4	14%	4	22%	5	31%
5	Available staff	16	55%	8	44%	6	38%
6	All of the above named possible barriers	12	41%	9	50%	6	38%
7	Other barrier	12	41%	6	33%	3	19%

To create Table 5-7, the researcher combined all categories of respondents in order to examine the total responses and to determine how they changed from survey #1 to survey #3. For example, the time barrier decreased from 62% in survey #1 to 56% in survey #3. Concerns about cost /budget barriers, voiced by

respondents, increased from 59% to 63%. There was a considerable decrease in respondents who thought they would be hampered by a lack of technical ability, from 41% in survey #1 to 25% in survey #3. However, it is alarming to note that those respondents who stated that poor management support was a barrier increased from 14% in survey #1 to 22% in survey #2 and to 31% in survey #3.

A gradual decrease was seen in the number of respondents who stated that the availability of staff would be a barrier and a considerable decrease, from 41% to 19%, in the number who cited other barriers. Answers citing “other” are shown in more depth in Table 5-9.

Overall the most frequently cited barrier was cost/budget, by 63% of respondents, with time being next at 56%.

In order to assess these barriers further, this research examined the possible barriers to *WCAG 2.0* compliance cross-tabulated with the ownership category of the websites in Table 5-8. Although this table is data-heavy, it is important to be able to consider which categories experienced the different barriers in order to answer the supporting questions. The supporting questions considered whether the different types of organisation played any role in their accessibility compliance and to identify their perceptions of barriers to accessibility compliance.

Table 5-8: Barriers by category and survey number

Possible Barriers											
Category	Survey		time	cost/budget	technical ability	management support	available staff	All named barriers	other barriers	Total	
Federal Government	Survey	1	Count	2	3	2	3	2	3	2	6
			% of Total	11.1%	16.7%	11.1%	16.7%	11.1%	16.7%	11.1%	33.3%
		2	Count	2	3	1	1	3	3	2	5
		% of Total	11.1%	16.7%	5.6%	5.6%	16.7%	16.7%	11.1%	27.8%	
	3	Count	4	5	4	4	3	4	3	7	
		% of Total	22.2%	27.8%	22.2%	22.2%	16.7%	22.2%	16.7%	38.9%	
	Total	Count	8	11	7	8	8	10	7	18	
		% of Total	44.4%	61.1%	38.9%	44.4%	44.4%	55.6%	38.9%	100.0%	
State or Territory Government	Survey	1	Count	7	9	1	1	8	2	2	14
			% of Total	28.0%	36.0%	4.0%	4.0%	32.0%	8.0%	8.0%	56.0%
		2	Count	4	2	1	2	4	1	0	4
		% of Total	16.0%	8.0%	4.0%	8.0%	16.0%	4.0%	0.0%	16.0%	
	3	Count	5	5	0	2	4	1	1	7	
		% of Total	20.0%	20.0%	0.0%	8.0%	16.0%	4.0%	4.0%	28.0%	
	Total	Count	16	16	2	5	16	4	3	25	
		% of Total	64.0%	64.0%	8.0%	20.0%	64.0%	16.0%	12.0%	100.0%	
Local Government	Survey	1	Count	2	1	2		2	1		3
			% of Total	25.0%	12.5%	25.0%		25.0%	12.5%		37.5%
		2	Count	1	2	1		0	2	n/a	4
		% of Total	12.5%	25.0%	12.5%	n/a	0.0%	25.0%		50.0%	
	3	Count	0	0	0		0	1		1	
		% of Total	0.0%	0.0%	0.0%		0.0%	12.5%		12.5%	
	Total	Count	3	3	3		2	4		8	
		% of Total	37.5%	37.5%	37.5%		25.0%	50.0%		100.0%	
Government-Affiliated e.g. power utility	Survey	1	Count	2	1	2	1		0	1	2
			% of Total	40.0%	20.0%	40.0%	20.0%		0.0%	20.0%	40.0%
		2	Count	0	0	0	0		1	2	2
		% of Total	0.0%	0.0%	0.0%	0.0%		20.0%	40.0%	40.0%	
	3	Count	1	1	1	0		0	0	1	
		% of Total	20.0%	20.0%	20.0%	0.0%		0.0%	0.0%	20.0%	
	Total	Count	3	2	3	1	n/a	1	3	5	
		% of Total	60.0%	40.0%	60.0%	20.0%		20.0%	60.0%	100.0%	
Not-For-Profit Organisation	Survey	1	Count	2	1	1			0	1	2
			% of Total	40.0%	20.0%	20.0%			0.0%	20.0%	40.0%
		2	Count	0	0	0			1	1	2
		% of Total	0.0%	0.0%	0.0%	n/a		20.0%	20.0%	40.0%	
	3	Count	0	0	0			1	0	1	
		% of Total	0.0%	0.0%	0.0%			20.0%	0.0%	20.0%	
	Total	Count	2	1	1			2	2	5	

		% of Total	40.0%	20.0%	20.0%			40.0%	40.0%	100.0%
Commercial Organisation	Survey	Count	1	n/a	n/a			1	n/a	2
		% of Total	50.0%					50.0%		100.0%
	Total	Count	1					1		2
		% of Total	50.0%					50.0%		100.0%

Table 5-8 demonstrates that in the federal government category, respondents named cost/budget as the primary barrier, followed by all named barriers. In contrast, the state or territory category allocated equal importance to time, cost/budget and available staff. Local government detailed time, cost/budget and technical ability equally, but 50% of respondents selected all named barriers. The non-government respondents to this question were very few and therefore results are not indicative of the entire group. One of the lowest rating choices in all categories was technical ability. This indicated that, while respondents reported they had the necessary technical ability, other factors caused barriers to their ability to meet compliance requirements.

As 38.9% of federal government and 12% of state government respondents indicated other barriers affecting their ability to achieve compliance, this information is further explored in Table 5-9.

Table 5-9: Cross tabulation of other barriers, category and survey

Other Barriers							
Category	Survey	Dealing with content and content creators including PDF	Size of site	Website still in development	Market capability and capacity	CMS issues	Responsibility issues
Federal Government	1	1			1	0	0
	Survey 2	1			0	1	0
	3	1			1	0	1
	Total	3			2	1	1
State/Territory government	1	1	1				
	Survey 3	1	0				
	Total	2	1				
Government-Affiliated	1		1				0
	Survey 2		1				1
	Total		2				1
Not-For-Profit Organisation	1			1	0		
	Survey 2			0	1		
	Total			1	1		
Total	1	2	2	1	1	0	0
	Survey 2	1	1	0	1	1	1
	3	2	0	0	1	0	1
	Total	5	3	1	3	1	2

Table 5-9 shows that the greatest concerns for respondents who identified other barriers were difficulties with content and content creators including the use of PDF for government websites. The only answers received from the non-government category was one comment each under the topics of websites still in development and market capability.

As respondents have been asked questions about the compliance levels of their websites, it is important to understand the methods and timing of the evaluation of the websites in order to answer the research questions. Table 5-10 provides results for the question asking when the website was last audited for accessibility guideline compliance. Table 5-12 records whether agencies are being audited for compliance, either internally or externally.

Table 5-10: Cross tabulation of last audit, category and survey

When the website was last audited for accessibility guideline compliance								
Category	Survey	less than 1 month ago	more than 1 month, but less than 3 months ago	more than 3 months, but less than six months ago	more than six months, but less than 1 year ago	more than one year ago	never	currently in progress
Federal Government	1	3	1	3		2		0
	Survey 2	2	1	0		0		2
	3	3	4	1		0		0
	Total	8	6	4		2		2
State/Territory Government	1	2	2	3	1	3	1	2
	Survey 2	1	1	1	1	1	0	0
	3	1	1	2	0	2	1	0
	Total	4	4	6	2	6	2	2
Local Government	1	0		0	1	1		1
	Survey 2	2		1	0	0		1
	3	0		0	1	0		0
	Total	2		1	2	1		2
Government-Affiliated	1	1			1	0		1
	Survey 2	0			1	0		1
	3	0			0	1		0
	Total	1			2	1		2
Not-For-Profit Organisation	1			0		3		0
	Survey 2			0		0		2
	3			1		0		0
	Total			1		3		2
Commercial Organisation	Survey 1						2	
	Total						2	
Total	1	6	3	6	3	9	3	4
	Survey 2	5	2	2	2	1	0	6
	3	4	5	4	1	3	1	0
	Total	15	10	12	6	13	4	10

The survey responses shown in Table 5-10 indicate that the organisations were auditing the compliance of their websites with increasing frequency during the time from survey #1 to survey #3. This did not answer the survey question about how these audits were being conducted. That information was requested in the

subsequent questions. In survey #1, three respondents indicated that their website had never been audited for accessibility compliance. In survey #2, no respondents reported that their website had never been audited, while there was one report in survey #3. While this may indicate an increase in audit frequency and understanding of the need for compliance, it may merely mean that different organisations responded to the three surveys.

Table 5-10 indicates that the non-government categories have not been commissioning audits of their websites for accessibility as often as the government websites. Of the government categories, it is primarily the federal and state or territory government websites which are being audited.

The surveys asked about the standards (*WCAG 1.0*, *WCAG 2.0* or other) to which the websites had been audited. Not surprisingly the majority of respondents specified *WCAG 2.0* as this is the standard required by the *NTS* and the Australian Government.

Table 5-11: Cross tabulation of audit standard, category and survey

Standard to which website has been audited for accessibility compliance							
Category	Survey	WCAG 1.0	WCAG 2.0	other	unknown	It hasn't been audited as far as I am aware	Total
Federal Government	1	1	7	1			9
	Survey 2	0	4	1			5
	3	0	7	1			8
	Total	1	18	3			22
State/Territory government	1	3	6	0	4	1	14
	Survey 2	1	1	1	2	0	5
	3	2	4	0	0	1	7
	Total	6	11	1	6	2	26
Local Government	1	2	0	1		0	3
	Survey 2	2	1	0		1	4
	3	0	1	0		0	1
	Total	4	2	1		1	8
Government-Affiliated	1	0	2	1			3
	Survey 2	0	2	0			2
	3	1	0	0			1
	Total	1	4	1			6
Not-For-Profit Organisation	1	1	2		0		3
	Survey 2	0	1		1		2
	3	0	1		0		1
	Total	1	4		1		6
Commercial Organisation	Survey 1				1	1	2
	Total				1	1	2
Total	1	7	17	3	5	2	34
	Survey 2	3	9	2	3	1	18
	3	3	13	1	0	1	18
	Total	13	39	6	8	4	70

Table 5-11 shows that respondents to the three surveys in the federal government category revealed 5% had audited their website to *WCAG 1.0* while 81% had audited their websites to *WCAG 2.0*. In the state or territory category 23% had audited to *WCAG 1.0* while 42% had audited to *WCAG 2.0*. 23% of respondents did not know what standard had been used and 8% stated that, as far as they were aware, the website had not been audited. In the local government category, 50% had been audited to *WCAG 1.0*, 25% to *WCAG 2.0*, 25% indicated other standards and 25% stated that it had never been audited. In the government-affiliated category, 17% had been audited to *WCAG 1.0*, 67% to *WCAG 2.0* and 17% indicated other standards. The not-for-profit category also had 67% of respondents reporting *WCAG 2.0* as their auditing standard. These results indicate that the federal and state government agencies are more likely to audit their websites to *WCAG 2.0*, which may be expected due to the information circulated in the *NTS*.

Those respondents who answered “other” to the question about auditing standards did not identify different standards, but rather partial compliance. Some respondents indicated that the large nature of their websites prohibited every page being included in an audit and that compliance would be a gradual process for their agencies.

In the following question, respondents were asked to provide information, to the best of their knowledge, about the levels *WCAG 1.0* and *WCAG 2.0*, with which their websites complied.

Table 5-12: Cross tabulation of compliance level, category and survey

Statement: to the best of my knowledge, this website is currently compliant to:								
Category	Survey	WCAG 1.0	WCAG 1.0	WCAG 2.0	WCAG 2.0	WCAG 2.0	unknown	Total
		A	AA	A	AA	AAA		
Federal Government	1	3	1	3	0		2	9
	Survey 2	2	1	1	0		1	5
	3	0	1	4	2		1	8
	Total	5	3	8	2		4	22
State/Territory Government	1	4	0	2	2	1	5	14
	Survey 2	0	1	1	1	0	2	5
	3	1	0	2	3	0	1	7
	Total	5	1	5	6	1	8	26
Local Government	1	1	1	0	0		1	3
	Survey 2	1	1	1	0		1	4
	3	0	0	0	1		0	1
	Total	2	2	1	1		2	8
Government-Affiliated	1		1	0	1	1	0	3
	Survey 2		0	1	1	0	0	2
	3		0	0	0	0	1	1
	Total		1	1	2	1	1	6
Not-For-Profit Organisation	1	0	1		0		2	3
	Survey 2	1	0		1		0	2
	3	0	0		1		0	1
	Total	1	1		2		2	6
Commercial Organisation	Survey 1			1			1	2
	Total			1			1	2
Total	1	8	4	6	3	2	11	34
	Survey 2	4	3	4	3	0	4	18
	3	1	1	6	7	0	3	18
	Total	13	8	16	13	2	18	70

32% of respondents to survey #1 were not aware of the levels of compliance of their websites. This lack of awareness had been reduced to 18% by survey #3. More organisations were aware of the levels of compliance for their websites. Table 5-12 also indicates that the number of website owners who stated their website was compliant with WCAG 2.0 A has almost doubled, from 18% to 35%. An even greater percentage increase occurred between survey #1 and survey #3 among respondents who stated their websites were compliant

with *WCAG 2.0* AA rising from 9% to 35%. Two respondents, 6% of the total, to the survey #1 indicated that their websites were compliant with Level AAA of *WCAG 2.0*. This percentage decreased to zero for surveys #2 and #3. This decrease could have been due to a number of possibilities:

- Different people or agencies replying to the surveys;
- Greater knowledge of *WCAG 2.0*, where the first statements were made in error; or
- The websites had deteriorated over the data collection period from complying with Level AAA to having lower grades for subsequent evaluations.

The two organisations claiming AAA compliance in survey #1 included a state government website and a government-affiliated website. The respondents claiming AAA compliance did not complete the subsequent surveys, so there is no way to determine how they now view the accessibility compliance of their websites. The manual, automated and user evaluations conducted during this study indicate that few websites comply with *WCAG 2.0* A. None of those tested in this study would have complied with AAA. It was also expected that very few websites would attempt to comply with AAA level, despite the Australian Human Rights Commission's statement:

... some web resources may need to achieve Level AAA conformance, for example, online resources published by education institutions and which are intended for use by all students studying a particular course. (Australian Human Rights Commission, 2010)

This relates to supporting questions 2 and 3 of this research:

“What are the key elements of a website assessment evaluation methodology?” and “What are the critical success factors for organisations that achieve compliance with *WCAG 2.0* A or AA?”

Obviously, one of the key elements of a website assessment evaluation methodology would be a thorough knowledge of the guidelines, in this case, *WCAG 2.0*. Few website owners, having a thorough knowledge of *WCAG 2.0*, would venture to say that their websites complied with level AAA.

Critical success factors for an organisation in achieving compliance with *WCAG 2.0* would be understanding the requirements of *WCAG 2.0* and having the technical and resource capability for testing the website and implementing the necessary procedures to achieve that compliance after testing.

It is necessary to understand a number of things about how websites are evaluated – whether the website had been evaluated through an internal or external audit, and what tools were used – manual, automated, user testing or a combination, in order to be able to make a statement about their compliance.

A subsequent survey question asked how the evaluation had been conducted – whether with an internal audit, an external audit or if the audit was unverified. The results are provided in Table 5-13.

Table 5-13: Cross tabulation of verification, category and survey

How the standard was verified					
Category	Survey	Internal audit	External audit	Unverified	Total
Federal Government	Survey 1	4	4	1	9
	Survey 2	1	1	3	5
	Survey 3	4	2	2	8
	Total	9	7	6	22
State or Territory Government	Survey 1	4	7	3	14
	Survey 2	1	1	3	5
	Survey 3	4	0	3	7
	Total	9	8	9	26
Local Government	Survey 1	1	1	1	3
	Survey 2	1	2	1	4
	Survey 3	0	1	0	1
	Total	2	4	2	8
Government-Affiliated	Survey 1	2	1	0	3
	Survey 2	1	0	1	2
	Survey 3	0	0	1	1
	Total	3	1	2	6
Not-For-Profit Organisation	Survey 1	1	1	1	3
	Survey 2	0	1	1	2
	Survey 3	0	1	0	1
	Total	1	3	2	6
Commercial Organisation	Survey 1			2	2
	Total			2	2
Total	Survey 1	12	14	8	34
	Survey 2	4	5	9	18
	Survey 3	8	4	6	18
	Total	24	23	23	70

On the surface, it would appear that state government agencies were more likely to audit their websites either internally or externally. State government respondents stated that seventeen had either an internal or external audit performed, compared with sixteen for the federal government. However, it should be noted

that 35% of respondents represented state government agencies compared to 25% of respondents for federal government agencies. Thus, a greater proportion of the federal government than state government agencies had undertaken either an internal or an external audit. The data in Table 5-13 indicates that far fewer of the agencies in other categories had undertaken website accessibility audits.

Table 5-14: Verification method percentage distribution

Verification Method	Survey 1 (%)	Survey 2 (%)	Survey 3 (%)
Internal audit	35	22	44
External audit	41	28	22
Unverified	24	50	33

Table 5-14 shows there was an increase in organisations performing their own internal website audits, and a decrease in those obtaining external verification. As one of the limitations expressed in previous survey responses was a lack of financial resources for accessibility, this decrease may mean that organisations have not been provided with sufficient funding to obtain external verification of the levels of compliance of their websites. Another contributing factor may be that organisations lack knowledge about providers of external website auditing services. The reporting requirements of the *NTS* do not clearly state whether organisations should have the results of their website audits verified in any way, either through a rigorous or prescribed process or through external auditors. These factors may be related back to the principal research question about the effectiveness of a government-mandated web accessibility strategy. Not all of the organisations responding to the surveys were federal government websites and subject to the *NTS*, but the majority were government-related.

The respondents were asked which auditing techniques were used in the process of conducting their website accessibility audit. The choices were a combination of methods including automated, manual and user testing, using external specialists, or focusing solely on either manual or automated methods.

Table 5-15: Cross tabulation of auditing techniques, category and survey

Auditing techniques and tools used in the previous website audit							
Category	Survey	Combination - automated, manual expert/ user test	External specialist	Automated only	Manual only	Unsure	Total
Federal Government	1	5	1	3	0	0	9
	Survey 2	1	1	1	0	0	3
	3	4	0	1	2	1	8
	Total	10	2	5	2	1	20
State/Territory Government	1	2	1	2	1	4	10
	Survey 2	1	1	0	1	1	4
	3	3	0	2	1	1	7
	Total	6	2	4	3	6	21
Local Government	1	0		1		1	2
	Survey 2	3		0		0	3
	3	1		0		0	1
	Total	4		1		1	6
Government-Affiliated	1	1		1			2
	Survey 2	2		0			2
	Total	3		1			4
Not-For-Profit Organisation	1	1	1		1		3
	Survey 2	0	1		0		1
	3	0	0		1		1
	Total	1	2		2		5
Total	1	9	3	7	2	5	26
	Survey 2	7	3	1	1	1	13
	3	8	0	3	4	2	17
	Total	24	6	11	7	8	56

Table 5-15 reveals that half of the federal government respondents reported the use of a combination of methods for auditing their websites, as did 29% of state or territory government respondents. An equal number were unsure of the methods used to audit their websites.

In response to this open-ended question, participants also listed a number of tools and methods which were then grouped by the researcher to facilitate a quantitative analysis. Some of the tools and methods mentioned included automated and semi-automated tools, such as *AChecker*, *W3C Validator*, *Colour Contrast Analyser*, *WAVE toolbar*, *Firebug*, *Total Validator*, *Fangs*, *Web Developer*, *NVDA* screen reader, *JAWS* screen reader,

SortSite, ZoomText, Dragon Speaking Naturally, Accenture Digital Diagnostics Engine, Codesniffer tool in Squiz Matrix CMS, and the Web Accessibility Toolbar. A number of respondents indicated they used a combination of human review and automated testing, while others said they performed checks manually using a WCAG checklist. Some website owners responded that they ran daily compliance checks as content was up-loaded, while others stated they used their content management systems to prevent inaccessible content being loaded. Some agencies stated that they only conducted testing during the development or deployment stages, while others stated they tested across multiple browsers as part of their on-going testing. None of the respondents stated that they relied only on user testing.

Of the two websites which claimed AAA compliance in survey #1, one had been subject to an external audit, and the other to an internal audit.

Very few of the respondents indicated that their testing regime included people with disabilities and none mentioned testing by senior citizens. The majority of the respondents stated they used a combination of manual and automated tools. A number of the respondents indicated that they only used automated tools, which is not the method preferred in information provided either by AGIMO for the NTS, or in the W3C materials on website accessibility evaluation (Vigo et al., 2013). Discussion of testing methods was provided in other sections of this thesis: Chapter 4.4 on automated testing, Chapter 2.1.10 on website evaluation methods and Chapter 6.1.1 on the critical importance of method selection.

Respondents were then asked questions about their progress in achieving website accessibility compliance to Level A by December 2012, the NTS deadline for the first stage.

Table 5-16 Cross-tabulation - Meeting WCAG 2.0 Level A, category and survey

Statement of progress in achieving compliance to WCAG 2.0 – We are already at WCAG 2.0 Level A							
Category	Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
Federal Government	1	0	1	1	4	1	7
	Survey 2	1	1	0	1	2	5
	3	1	4	0	1	2	8
	Total	2	6	1	6	5	20
State/Territory Government	1	3	3	4	2	2	14
	Survey 2	1	0	2	0	2	5
	3	0	2	3	1	1	7
	Total	4	5	9	3	5	26
Local Government	1		0	0	2	1	3
	Survey 2		2	1	0	1	4
	3		0	1	0	0	1
	Total		2	2	2	2	8
Government-Affiliated	1	1		0	2		3
	Survey 2	0		1	1		2
	3	0		1	0		1
	Total	1		2	3		6
Not-For-Profit Organisation	1	0		1		1	2
	Survey 2	1		0		1	2
	3	1		0		0	1
	Total	2		1		2	5
Commercial Organisation	Survey 1		1		1		2
	Total		1		1		2
Total	1	4	5	6	11	5	31
	Survey 2	3	3	4	2	6	18
	3	2	6	5	2	3	18
	Total	9	14	15	15	14	67

Table 5-16 demonstrates the changes in the compliance levels organisations reported they had achieved at the beginning, middle and end of this study's data collection period. Survey #1 was completed between September and December 2011, close to the beginning of the NTS. At that time, only one of the federal government respondents reported that WCAG 2.0 Level A had already been achieved. By the end of the

survey #2, two out of five federal government respondents claimed to have reached *WCAG 2.0* Level A. Of the survey #3 respondents in December 2012, at the time of the *NTS* deadline for compliance with Level A, 63% reported their agencies were compliant.

This provides a contrast with the state or territory category. In survey #1, 43% of respondents reported their agencies were at Level A. By survey #2 the proportion had fallen to 20%, but rose in survey #3 to 29%. These results may indicate a level of misplaced confidence in the agencies' compliance levels, or it may have been due to the respondents responsible for completing the subsequent surveys differing from those who completed the first.

Agencies from the other categories did not reflect as much confidence in their compliance with *WCAG 2.0* Level A as the federal and state government categories.

In the next question of the survey, participants were asked whether their organisations were experiencing any difficulties in meeting *WCAG 2.0* Level A by the *NTS* deadline of December 31, 2012.

Table 5-17: Cross tabulation with difficulty in achieving compliance with WCAG 2.0 A, category and survey

Statement: We are experiencing some problems meeting WCAG 2.0 Level A by December 2012							
Category	Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
Federal Government	1		5	1	1	0	7
	Survey 2		2	0	2	1	5
	3		4	1	2	1	8
	Total		11	2	5	2	20
State/Territory Government	1	1	0	8	2	3	14
	Survey 2	0	2	1	1	1	5
	3	2	3	1	1	0	7
	Total	3	5	10	4	4	26
Local Government	1	1	1	1			3
	Survey 2	1	1	2			4
	3	0	0	1			1
	Total	2	2	4			8
Government-Affiliated	1	1	2	0			3
	Survey 2	0	2	0			2
	3	0	0	1			1
	Total	1	4	1			6
Not-For-Profit Organisation	1	0		1		1	2
	Survey 2	1		0		1	2
	3	0		0		1	1
	Total	1		1		3	5
Commercial Organisation	Survey 1			2			2
	Total			2			2
Total	1	3	8	13	3	4	31
	Survey 2	2	7	3	3	3	18
	3	2	7	4	3	2	18
	Total	7	22	20	9	9	67

Table 5-17 demonstrates that eleven or 55% of federal government respondents indicated that they would have trouble meeting the deadline of December 31, 2012. Survey #3 coincided with this deadline and, according to respondents, very few federal government agencies met the deadline. This discrepancy might be seen as the agencies' lack of appropriate auditing methods, their lack of understanding of the requirements of WCAG 2.0 or an overly optimistic view of the accessibility of their websites.

In the state or territory category, eight of the twenty-six respondents, or 31%, indicated that their organisations would have trouble meeting the deadline. Ten, or 38%, neither agreed nor disagreed with the statement, perhaps indicating some confusion as to their ability to comply with the deadline. However, while in survey #1 only one respondent indicated the agency was experiencing difficulties, by survey #3 this had increased to five respondents. This is a considerable increase as the number of respondents had halved between surveys #1 and #3.

Of the total number of respondents to this question, twenty-nine, or 43%, indicated that their agencies would have trouble meeting the deadline, while twenty, or 30%, neither agreed nor disagreed.

The researcher also sought to determine whether agencies experienced any difficulties understanding *WCAG 2.0* Level A requirements, as such a lack of understanding might explain the difficulties agencies experienced in meeting its requirements. The responses to this question are shown in Table 5-18.

Table 5-18: Cross-tabulation - difficulty understanding WCAG 2.0 Level A, category and survey

We are currently experiencing difficulty understanding WCAG 2.0 Level A requirements						
Category	Survey	Yes	No	Not applicable	Total	
Federal Government		1	0	7	7	
	Survey	2	1	4	5	
		3	0	8	8	
	Total		1	19	20	
State/Territory Government		1	4	9	1	14
	Survey	2	0	5	0	5
		3	2	5	0	7
	Total		6	19	1	26
Local Government		1	1	2		3
	Survey	2	2	2		4
		3	0	1		1
	Total		3	5		8
Government-Affiliated Organisations		1	0	2	1	3
	Survey	2	1	1	0	2
		3	0	0	1	1
	Total		1	3	2	6
Not-For-Profit Organisation		1		2		2
	Survey	2		2		2
		3		1		1
	Total			5		5
Corporate Organisation	Survey	1	1	1		2
	Total		1	1		2
		1	6	23	2	31
Total	Survey	2	4	14	0	18
		3	2	15	1	18
	Total		12	52	3	67

Table 5-18 shows that 78% of respondents stated that they were not having trouble understanding the requirements of WCAG 2.0 Level A. However, the evaluation results clearly show that very few websites met WCAG 2.0 to Level A. There is a discrepancy between the understanding of WCAG 2.0 by the survey respondents and the poor compliance results of the evaluations. There is the possibility that while the survey participants understood WCAG 2.0 requirements, there were other barriers, such as time, cost, and technical ability that prevented them from actually achieving that level of compliance. If the survey respondents did truly understand the requirements, and they had stated that the websites were compliant, then the poor results of evaluations of compliance with guidelines must be linked to the methods used to assess compliance.

A subsequent question asked respondents about the most difficult technical aspects they faced in achieving compliance with website accessibility standards. This question related to supporting questions three and four regarding critical success factors. Many respondents revealed the technical issues which influenced their ability to comply with the guidelines and identified the obstacles they faced.

Table 5-19: Cross tabulation difficult technical issues, category and survey

Most difficult technical issue in achieving compliance								
Category	Survey	Document creation and management	Multi-media	Education and skill training of technical staff and contractors & changing requirements	Java-Script / AJAX	CMS & hosting services	Miscellaneous: devices, resourcing, tables, finding appropriate tools	Total
Federal Government	1	1	3	1			2	7
	Survey 2	1	0	1			3	5
	3	2	0	2			3	7
	Total	4	3	4			8	19
State/Territory Government	1	1	1	3		1	3	9
	Survey 2	1	0	1		0	1	3
	3	3	1	1		0	2	7
	Total	5	2	5		1	6	19
Local Government	1				1	1	1	3
	Survey 2				0	0	3	3
	3				0	0	1	1
	Total				1	1	5	7
Government-Affiliated	1	0		1			1	2
	Survey 2	1		0			1	2
	Total	1		1			2	4
Not-For-Profit Organisation	Survey 1				1			1
	Total				1			1
Commercial Organisation	Survey 1						1	1
	Total						1	1
Total	1	2	4	5	2	2	8	23
	Survey 2	3	0	2	0	0	8	13
	3	5	1	3	0	0	6	15
	Total	10	5	10	2	2	22	51

Table 5-19 displays the grouped anecdotal responses to facilitate comparison. Federal and state or territory government agencies were most concerned with document creation or management and the education and skills training of technical staff and contractors to meet changing requirements. There were also a number of miscellaneous responses which discussed issues of resourcing, working with tables and finding appropriate tools. Respondents discussed the difficulties they faced in maintaining the awareness of the staff and contractors and how they could keep these staff up-to-date with changing requirements and techniques. These responses also included the fact that it can be difficult to get software and other vendors to comply with WCAG 2.0. One respondent stated that developers generally do not understand WCAG 2.0 and the agency's web team did not have the technical skills to know if the developers' code was compliant. Working with documents, including optical character recognition (OCR) formats for PDF in very large quantities, was another issue identified by respondents. They discussed the fact that software from suppliers, for example for integrated forms, may not be compliant and might be particularly difficult to change. However, respondents communicated that users still expect seamless experiences. Another respondent declared that finding accessible grid controls has been problematic. This respondent stated that embedded Flash™ video players exhibit keyboard accessibility issues caused by the inability of Flash to pass keyboard focus back to HTML. In context, some of the simplest issues, for success criteria 2.4.4 and 2.4.9 for example, have been difficult. A decentralised publishing model means that content is created by non-technical people, who inadvertently create significant additional work for editors to fix content in an environment where the staffing resources are constantly diminishing. Another respondent stated that, due to the size of the agency's website, staff did not have a complete list of all websites and had no means of running automated checks on the sites that they did know about.

Some respondents identified issues regarding reporting tools and how the web team needed to have a detailed technical understanding and time to determine whether issues were crucial or not. Limited resources made it difficult to devote time to addressing technical issues. A number of respondents discussed multimedia issues, including the time-consuming task of subtitling videos and replacing PDFs with accessible alternatives. It was also expected that, in many cases, the source document was no longer available, requiring the use of a product such as *Adobe Acrobat Pro* to export PDFs to *Microsoft Word*, *Excel* or whichever source was required.

One organisation, SG34, claimed that its site had been designed from the ground up to be compliant and complied with WCAG 2.0 to Level AA. A re-examination of the manual evaluation results in Chapter 4 shows that while this agency decreased its violations by just over 25% between the two evaluations, this website still ranked 122 of the 138 websites in Evaluation #1 and 112 in Evaluation #2. These results show that it is still a considerable distance from WCAG 2.0 AA compliance. In the user testing, SG34 was ranked at 39, with a score of 15 of a possible 25 and showing 10 fail gradings of a possible 20. This was validated by a relatively static automated testing score of 115 pages with accessibility violations, 10.4% of the pages tested, in Evaluation #2.

This figure decreased to 69 pages, or 5.39%, for the automated evaluation #7. While improvement was clearly demonstrated, a lower number of failures might be expected for a website claiming AA compliance.

Chapter 4 discussed the matter of PDF documents and the AGIMO requirement for agencies to provide an accessible alternative. The surveys asked respondents how they proposed to deal with PDF documents. This question was answered by anecdotal comments in all three surveys. The use of PDFs was identified as a common obstacle, along with *MS Word* and *Excel* documents which are often provided by websites.

Table 5-20: Cross tabulation PDF format, category and survey

How have you decided to deal with the issue of PDF?										
Category	Survey	we will probably ignore the guidelines for this issue	we will provide alternative formats for all PDF documents	we have a planned strategy to convert PDF documents to a more accessible format	we believe PDF formats will become acceptable - have decided to 'wait and see'	we do not use PDF formats on our website	we have not yet made a decision	we will probably ignore the guidelines for this issue	other	Total
Federal Government	1	0	4	1				2		7
	Survey 2	0	2	1				2		5
	3	7	0	0				1		8
	Total	7	6	2				5		20
State/Territory Government	1	1	4	1			6	2		14
	Survey 2	0	1	1			1	2		5
	3	4	3	0			0	0		7
	Total	5	8	2			7	4		26
Local Government	1	0	2	1			0			3
	Survey 2	0	1	1			2			4
	3	1	0	0			0			1
	Total	1	3	2			2			8
Government-Affiliated	1	1	2				0			3
	Survey 2	0	1				1			2
	3	1	0				0			1
	Total	2	3				1			6
Not-For-Profit Organisation	1	0	0		1	1	0			2
	Survey 2	0	1		0	0	1			2

	3	1	0		0	0	0		1
Commercial	Total	1	1		1	1	1		5
Organisation	Survey 1					1	1		2
	Total					1	1		2
	1	2	12	3	1	2	7	4	31
Total	Survey 2	0	6	3	0	0	5	4	18
	3	14	3	0	0	0	0	1	18
	Total	16	21	6	1	2	12	9	67

Table 5-20 demonstrates that, by survey #3, seven of eight, or 88%, of federal government agencies had decided to ignore the guidelines provided by the federal government. This contrasts with surveys #1 and #2, where six respondents planned to provide alternative formats for these documents. This might be due to a number of organisations anticipating that the federal government would reverse its requirement for the provision of accessible alternatives for PDFs. In effect, the federal government conducted a review of the *Web Guide* (Australian Government, 2011; vanTeulingen, 2014) and decided that the requirement to provide alternatives to PDFs will remain for the foreseeable future, due to the lack of accessibility support for PDFs on mobile platforms. None of the federal government organisations stated that they were still trying to decide how to handle this issue.

This contrasts with the state or territory agencies where five, or 22%, of respondents planned to ignore the guidelines, but 31% planned to provide alternative formats for all PDFs. Additionally, seven agencies, or 27%, had not, at the time of writing, made a decision on this matter.

Across all three surveys, 24% of respondents stated that they planned to ignore the guidelines regarding PDFs, 31% stated they would provide alternative formats for all PDF documents, 9% stated they had a planned strategy to convert PDFs to a more accessible format, 1% stated they were planning to wait to see if the guidelines changed, 3% stated they did not use PDFs on their websites, and 18% stated they had not yet made a decision.

A number of anecdotal comments under “other” provided additional explanations of the different opinions among website owners about PDF documents. While some respondents stated that they would provide both PDFs and alternatives where possible, they stated that they believed PDFs would become more acceptable over time. Another respondent stated that PDFs would continue to be used as the alternatives were less accessible. Other respondents discussed the fact that, while they were working on converting PDFs to HTML format in most cases, they would still need PDFs because they were easier to email and created quickly. Other

respondents discussed their use of PDF in smart forms. Some respondents believed that many users of assistive technologies did not find PDFs to be inaccessible. While they would continue to publish documents in multiple formats, they did not feel it was a significant problem for users. Another respondent revealed that documents in RTF and some HTML were being provided for the most popular and important PDF documents. It was stated that the respondent's agency insists that all PDFs are properly structured and tagged, based on an accessible template with document properties properly described. Testing of PDF documents was not within the scope of this research and while PDF without alternatives were noted and assigned penalty points during manual evaluations, the documents themselves or their alternatives were not tested.

The surveys included a number of questions asking which groups would most benefit from accessible websites, and also whether website owners had encountered issues raised by users about the accessibility of their websites. Almost all respondents stated that all users benefit from accessible websites, with only one respondent disagreeing in each of survey #1 and #2.

Table 5-21: Cross-tabulation Users who benefit, category and survey

Which users do you believe benefit from a more accessible website? All users benefit from an accessible website.						
Category	Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Total
Federal Government	1	5	2			7
	Survey 2	2	3			5
	3	7	1			8
	Total	14	6			20
State/Territory Government	1	8	3	2	1	14
	Survey 2	2	3	0	0	5
	3	5	2	0	0	7
	Total	15	8	2	1	26
Local Government	1	3	0			3
	Survey 2	3	1			4
	3	1	0			1
	Total	7	1			8
Government-Affiliated	1	1	1	1		3
	Survey 2	0	1	0		1
	3	1	0	0		1
	Total	2	2	1		5
Not-For-Profit Organisation	1	1		1	0	2
	Survey 2	1		0	1	2
	3	1		0	0	1

	Total	3		1	1	5
Commercial	Survey 1	1	1			2
Organisation	Total	1	1			2
	1	19	7	4	1	31
Total	Survey 2	8	8	0	1	17
	3	15	3	0	0	18
	Total	42	18	4	2	66

Table 5-21 shows that 100% of federal government, local government, not-for-profit and corporate respondents agreed that all users benefit from an accessible website. Only three, or 12%, of state or territory government respondents disagreed.

The survey asked about the benefits for specific user groups, those with visual impairments, auditory impairments, older users, multiple low-level impairments, users with limited computer or Internet skills, and those with cognitive impairments, from accessible websites.

Table 5-22: Accessibility of websites for different groups of users with disability

User group	Percentage strongly agree or agree
Visual impairment	98%
Multiple low-level impairments	97%
Older users	95%
Auditory impairment	91%
Cognitive impairment	90%
All users	90%
Limited computer or Internet skills	88%

Table 5-22 demonstrates that the majority of respondents felt that accessible websites were of the most benefit to those with either visual or multiple low-level impairments. Whether this is true cannot be verified, but the responses may indicate the attention that website accessibility for people with vision impairments has received internationally, including the litigation efforts of visual disability support organisations such as the National Federation of the Blind. (National Federation of the Blind, 2008, 2014; W3C, 2009a)

In the surveys, the researcher also asked respondents whether users had raised issues regarding the accessibility of the websites with the organisations.

Table 5-23: Cross-tabulation of users raising issues of accessibility, and category

We have had clients/users raise issues of website accessibility with us						
Category	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
Federal Government	8	5	3	4	0	20
State or Territory Government	4	10	4	5	3	26
Local Government	2	4	1	1	0	8
Government-Affiliated e.g. power utility	2	2	1	0	0	5
Not-For-Profit Organisation	3	2	0	0	0	5
Commercial Organisation	0	0	0	2	0	2
Total	19	23	9	12	3	66

Summarising from Table 5-23, it can be seen that 13 or 65% of federal government, 14 or 54% of state or territory governments, 6 or 75% of local government, 6 or 80% of government-affiliated, and 5 or 100% of not-for-profit respondents revealed that clients or users had raised issues of website accessibility with them. While none of the commercial organisations indicated that they had received complaints, there were only two respondents from this category to that particular question.

These responses relate to supporting question three regarding the critical success factors for organisations that achieve compliance to *WCAG 2.0* by listening to users and responding to their concerns. It might also raise issues about the principal research question, whether a government-mandated strategy is successful. These findings may be contrasted with organisations surveying their users and undertaking risk-avoidance of possible litigation, lack of user interaction with the website and negative public relations.

In order to determine the tools that organisations use to assist in evaluating websites, the researcher asked users whether they were familiar with various website accessibility and usability tools. While it could be argued that familiarity with the various tools does not necessarily indicate their use by the organisation, the researcher was more interested in which tools were most familiar to Australian respondents.

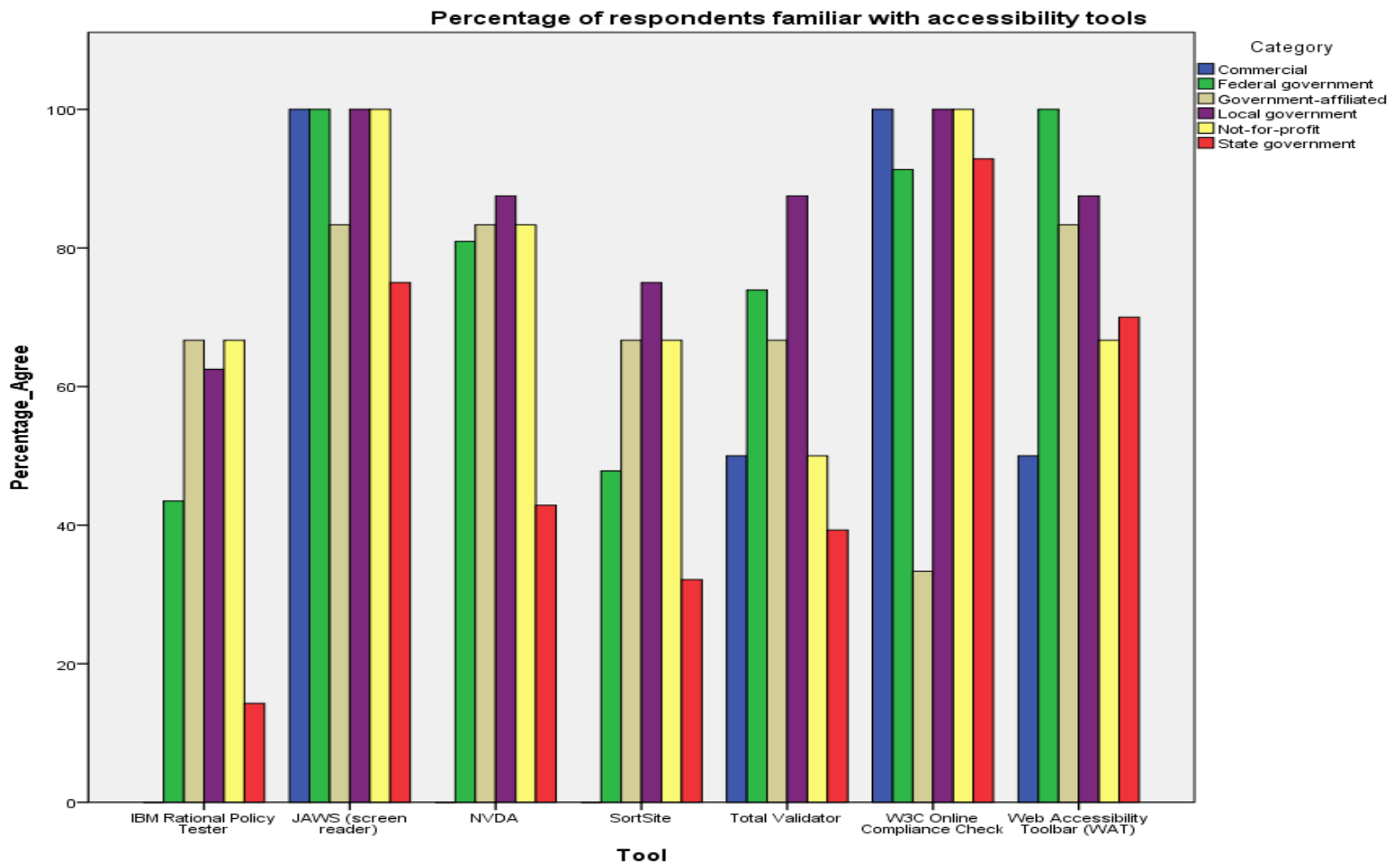


Figure 5-4: Familiarity with accessibility tools

From Figure 5-4 it is evident that most respondents agreed that they were familiar with checking their mark-up use with the *W3C Online Compliance Check*: 100% for local government, not-for-profit and corporate categories and slightly less, 91% and 93% respectively, for federal and state government websites. Only 33% of government-affiliated respondents stated they were familiar with the tool.

Familiarity with *SortSite*, the automated tool used in this study, was highest in the local government, government-affiliated and not-for-profit categories. This is possibly because of the relatively low cost of the tool and the speed with which it can crawl an entire website. Further details of the different tools are available in Chapter 6, Discussion.

One of the tools that most respondents expressed familiarity with is the *JAWS™* screen reader created by Freedom Scientific (Freedom Scientific, 2011). Federal government, local government, not-for-profit and corporate respondents all reported that they were familiar with this tool. 75% of state or territory governments and 85% of government-affiliated respondents indicated that they were familiar with *JAWS™*. *NVDA* is a free screen reader that has been developed in Australia and is gaining in popularity according to annual polls of users undertaken by *WebAIM* (*WebAIM*, 2012a). 81% of federal government, 88% of local government and 83% of both government-affiliated and not-for-profit respondents were familiar with this tool. However, only 43% of state or territory government and none of the corporate respondents stated they were aware of *NVDA*.

The *Web Accessibility Toolbar for Internet Explorer*, available at no charge from the Paciello Group, was known by all of the federal government respondents, but only by 70% of state or territory government agencies, 88% of local government and 83% of government-affiliated respondents. 67% of not-for-profit and 50% of corporate respondents were also aware of this toolbar. The *IBM Rational Policy Tester* was one of the least well-known tools and is also a relatively expensive addition to the list of possibilities. While 67% of government-affiliated and not-for-profit respondents were knew about it, the results for the other groups were considerably lower.

Total Validator was most well-known to federal and local government organisations. This tool has both free and paid subscriptions and was most familiar for federal and local government respondents, at 74% and 88% respectively.

In order to consider the changing awareness of the most popular tools between the three surveys, the research recorded those who strongly agreed or agreed in each survey.

Table 5-24: Familiarity with accessibility tools

Tools	Survey #1	Survey #2	Survey #3
	Strongly agree or agree	Strongly agree or agree	Strongly agree or agree
W3C Online Compliance Test	33/36 = 91.67%	19/20 = 95%	17/17 = 100%
JAWS	30/36 = 83.33%	20/20 = 100%	15/17 = 88.24%
Web Accessibility Toolbar	29/36 = 80.56%	17/20 = 85%	16/17 = 94.12%
NVDA	18/36 = 50.00%	14/20 = 70%	14/17 = 82.35%

Supporting question 2 concerned the key elements of a website assessment evaluation methodology. It appears that familiarity with the available tools and resources might be argued to be part of that set. Also, supporting question 3 considered critical success factors which might include familiarity with, and understanding of, these tools. Table 5-24 demonstrates the growth of familiarity with the testing tools, particularly for four specific tools. The large increase in the awareness of *NVDA*, an Australian-developed screen reader, is reflected in responses to the surveys. Annual surveys conducted by *WebAIM* indicate that, while *JAWS* is still the most used screen-reader, its “usage continues to decrease as the usage of *NVDA* and *VoiceOver* increases” (*WebAIM*, 2012a). The last *WebAIM* survey available to the researcher was conducted in May 2012. It should be noted that 73.1% of the respondents were from North America, compared with 3.4% from Australia and Oceania. As *NVDA* is Australian-developed, the actual results for Australian use could be significantly higher if solely Australian respondents were surveyed. While these results show an increasing familiarity with *NVDA*, it should be noted that this familiarity is stronger among organisations with websites than with users of screen-readers.

Finally, in order to determine whether participants were of the opinion that the *NTS* had the required effect upon website accessibility compliance, the researcher posed questions to each category of respondents. She asked whether the *NTS* provided a necessary impetus for them to address website accessibility, whether they would have achieved *WCAG 2.0* compliance without the *NTS* and whether the *NTS* has had any effect upon their efforts to achieve *WCAG 2.0* compliance.

The results for these three questions for the federal government category appear in Table 5-25.

Table 5-25: Federal Government – the NTS has provided impetus

Statement: The NTS has provided a necessary impetus for us to address website accessibility						
Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
1	5	3	7	4	2	21
2	1	5	3	2	1	12
3	4	3	5	0	1	13
Total	10	11	15	6	4	46

Table 5-25 shows that overall 46% agree that the NTS has provided the necessary impetus to achieve compliance. Across all three surveys, 33% neither agreed nor disagreed while 22% disagreed or strongly disagreed. As the NTS was principally targeted at federal government websites, this result is rather surprising.

In survey #1, 38% of respondents stated that the NTS had provided the necessary impetus to address website accessibility, with this percentage increasing to 50% in survey #2 and to 54% in survey #3. This indicates that, over time, respondents reported that the strategy was providing more impetus to help agencies address the issues of website accessibility.

The next question considered whether agencies would have achieved that compliance without the impetus of the NTS. The questions have been cross-tabulated with the survey numbers so that it may be observed whether the attitude changed over the course of the data collection period.

Table 5-26: Federal Government: Would have achieved compliance without NTS

Statement: We would have achieved WCAG 2.0 compliance without the NTS						
Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
1	6	6	4	4	1	21
2	2	4	3	0	3	12
3	1	1	5	3	3	13
Total	9	11	12	7	7	46

The results are rather surprising in that 44% either agreed or strongly agreed that they would have achieved compliance without the *NTS*, with 26% being ambivalent and 31% disagreeing or strongly disagreeing.

In survey #1, twelve respondents or 57% agreed, 50% agreed in survey #2, and 15% in survey #3. The data suggests that respondents were initially more optimistic about their ability to reach compliance without the *NTS* and became less positive by the end of the period which coincided with the first deadline, *WCAG 2.0* Level A by December 31, 2012.

In the final question of this group, the researcher asked whether the respondents considered that the *NTS* had little effect on their agencies' efforts to achieve *WCAG 2.0* compliance.

Table 5-27: Federal government - *NTS* has had little effect on compliance

Statement: The <i>NTS</i> has had little effect on our efforts to achieve <i>WCAG 2.0</i> compliance.						
Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
1	4	1	9	6	1	21
2	2	2	4	2	2	12
3	1	0	5	1	6	13
Total	7	3	18	9	9	46

Table 5-27 reveals that 22% of respondents reported they agreed with this statement, 40% neither agreed nor disagreed, and 40% disagreed.

The respondents in survey #1 demonstrated that 24% agreed with the statement that the *NTS* had little effect upon their efforts to achieve compliance, which increased to 34% in survey #2 and then decreased to 8% in survey #3. This suggests that respondents believed that, over the period of this study, the *NTS* did have an effect upon their efforts to achieve compliance. However, the responses were too inconsistent to permit any firm conclusions. It is possible that the wording might have confused some respondents, especially considering those who disagreed with the statement that the *NTS* had little effect. In survey #1, 33% disagreed, 33% disagreed in survey #2 and 54% in survey #3. This seemed to correlate more with an earlier question, showing that over time the appreciation of the *NTS* had grown, showing that it did indeed have an effect upon respondents' efforts to achieve *WCAG 2.0* compliance.

These results were consistent across the questions, but bring up an interesting point that respondents do not seem to feel strongly that the *NTS* has been of benefit in bringing their websites into *WCAG 2.0* compliance.

As mentioned previously in the discussion of the *NTS*, states and territories were encouraged to accept the same timeline as that of the *NTS* and, at the time of writing, most have done so. Information on South Australia's plans in this regard could not be found, but the other states except Western Australia have adopted the *NTS* timeframe. Western Australia has chosen to comply with *WCAG 2.0* to Level A by December 31, 2013, a year later than the initial deadline of the *NTS*. Western Australia has stated that Level AA is preferred, but not mandated. Local governments normally follow the guidance of their respective state or territory government agencies. Government-affiliated websites, while receiving government funding at least in part, do not appear to be aware of whether they are mandated by the *NTS* or not.

The researcher tried to ascertain the effects of the *NTS* upon the state or territory, government-affiliated and local government agencies. She asked similar questions to those asked of the federal government respondents, with some minor changes to reflect different reporting requirements.

The first question was the same as that asked of the federal government respondents: We have been influenced by the *NTS* to achieve *WCAG 2.0* compliance.

Table 5-28: State or territory governments - We have been influenced by the *NTS*

Statement: We have been influenced by the <i>NTS</i> to achieve <i>WCAG 2.0</i> compliance.						
Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
1	5	7	6	3	1	22
2	2	5	0	2	1	10
3	0	5	2	2	0	9
Total	7	17	8	7	2	41

Table 5-28 demonstrated that, in survey #1, 55% of state or territory government respondents agreed with this statement, compared with 70% in survey #2 and 56% in survey #3.

The next question was also the same as that asked of the federal government respondents, asking whether the *NTS* had little effect on their efforts to achieve *WCAG 2.0* compliance.

Table 5-29: State or territory governments -The NTS has had little effect

Statement: The NTS has had little effect on our efforts to achieve WCAG 2.0 compliance.						
Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
1	2	5	8	4	2	21
2	1	2	2	3	1	9
3	0	3	2	3	1	9
Total	3	10	12	10	4	39

Because of possible confusion caused by the negative wording of this question, it is important to consider those who disagree or strongly disagree, as in the federal government responses. Table 5-29 shows that in survey #1, 29% disagreed with the statement, 44% in survey #2 and 44% in survey #3. The responses seem to indicate that there was a growing appreciation of the NTS from the state or territory respondents.

The final question asked whether the respondent organisation had been using the work plan provided in the NTS to help them in their efforts to achieve compliance.

Table 5-30: We have been following the NTS work plan

Statement: We have been following the NTS work plan to achieve WCAG 2.0 compliance.						
Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
1	1	6	10	2	2	21
2	1	2	0	5	1	9
3	1	2	4	2	0	9
Total	3	10	14	9	3	39

Table 5-30 demonstrates that in each of the surveys 33% of respondents agreed that they were following the NTS plan to work towards compliance with WCAG 2.0. In survey #1, 48% neither agreed nor disagreed which suggests that at the start of the data collection period respondents may not have been aware of the method prescribed by the NTS, but that this awareness grew over the data collection period.

The final question in the survey looked at the possible effect of the NTS on the not-for-profit and corporate categories. While these websites do not come under the jurisdiction of the NTS, they are affected by the guidelines of the Australian Human Rights Commission and the DDA which advises compliance with WCAG 2.0

to Level AA by December 31, 2013 (Australian Human Rights Commission, 2010; W3C). The researcher attempted to discover whether there was some flow-on effect of the *NTS* upon these websites.

The first question asked whether respondents had read the *NTS*.

Table 5-31: Non-government: Have read the *NTS*

Statement: We have read the <i>NTS</i>						
Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
1	2	1	3	2	1	9
2	2	1	0	1	0	4
3	1	1	2	0	0	4
Total	5	3	5	3	1	17

Table 5-31 demonstrates that eight out of seventeen respondents, or 47%, had read the *NTS*. As only one of these respondents answered all three surveys, it is logical to assume that these are not all the same respondents answering the questions. The figure of 47% is higher than the results of the audits would indicate, due to the decreasing accessibility of these categories of websites.

The next question was the same as one asked of all the other categories, aiming to discover whether respondents had been influenced by the *NTS* to achieve *WCAG 2.0* compliance.

Table 5-32: Non-government: Influenced by the *NTS*

Statement: We have been influenced by the <i>NTS</i> to achieve <i>WCAG 2.0</i> compliance.						
Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
1	1	2	4	1	1	9
2	1	1	1	1	0	4
3	0	2	2	0	0	4
Total	2	5	7	2	1	17

A total of seven respondents, or 41%, stated that they had been influenced by the *NTS*, a rather surprising result when none of the websites had achieved compliance according to the audit results. Two of the

corporate websites came close to compliance, but one of the not-for-profit websites was closer to compliance at the beginning of the data collection than at the end.

The final question asked whether the respondents believed the *NTS* had little effect upon their efforts to achieve *WCAG 2.0* compliance. An examination will show whether those who disagree or strongly disagree with the statement is consistent with the other results.

Table 5-33: Non-government: *NTS* has had little effect

Statement: The <i>NTS</i> has had little effect on our efforts to achieve <i>WCAG 2.0</i> compliance.						
Survey	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree	Total
1	4	0	3	2	0	9
2	0	1	1	1	1	4
3	0	0	2	2	0	4
Total	4	1	6	5	1	17

Table 5-33 demonstrates that 35% of the respondents disagreed with the statement, 35% neither agreed nor disagreed and only 30% agreed that the *NTS* had little effect upon their efforts to achieve *WCAG 2.0* compliance.

The survey data provided has been valuable in assisting the researcher to gather information critical to understanding the motivation, barriers, concerns, and attitudes of the respondents. While the numbers of respondents were not as large as the researcher had desired, the anecdotal comments have been especially helpful.

There appears to be a considerable gap between how respondents view their efforts to achieve accessibility compliance and the survey results. What has been consistent is the attitude of the respondents from the most accessible websites. These respondents reflect a more mature organisational understanding of accessibility requirements, greater management support and greater familiarity with tools and methods for checking the accessibility of their websites.

The survey results have been instrumental in assisting the researcher to answer the supporting questions, particularly dealing with barriers and critical success factors in meeting compliance with *WCAG 2.0*.

Further discussion in Chapters 7 and 8 deals with the overall results of the different methods of analysis, including these survey results.

Chapter 6 discusses the impact of the data presented in Chapters 4 and 5. It includes an analysis of the critical importance of the method selection, and how the different evaluation methods might be best combined. It also includes a discussion of where accessibility and usability cross paths. The trends that were discovered in the data are presented, including the impact of technology upon accessibility and the effect the changing nature of websites has upon evaluating the accessibility of websites.

6 DISCUSSION

6.1 INTRODUCTION TO THE DISCUSSION

In Chapter 3, the testing methodology was discussed in detail and the different methods of testing used in this research were fully described. The methods used to assess the websites follow the guidance in the *WCAG Evaluation Methodology (WCAG-EM)* ("Accessibility, web sites and Australian Law," ; Wood et al., 2013; World Wide Web Consortium, 2014b).

To recapitulate briefly, this research used a mixed methods approach which included two manual expert evaluations, one at the beginning and one at the end of the data collection period. User testing was conducted gradually over the last half of the data collection period, seven rounds of automated testing were conducted on a continuous cycle from the beginning to the end of the data collection period, and three surveys conducted at the beginning, middle and end of the data collection period. The manual, user and automated testing provided quantitative data while the surveys provided some quantitative data and qualitative data. Open-ended questions elicited anecdotal comments describing problems the participants experienced with implementing website accessibility measures and those factors they considered critical for a website accessibility implementation strategy.

A number of steps of the research were conducted simultaneously, as shown in Figure 6-1. The surveys were sent to the research participants at the beginning, middle and end of the data collection period and were conducted while the manual and automated tests were being run. After some experimentation, it was found that up to five instances of *SortSite* could be loaded and run on websites at the same time. While slowing the system somewhat, five instances was considered to be the optimum number. The time it took *SortSite* to test 2000 pages depended upon the complexity of the website, the number of violations identified and the speed of the Internet connection at that time (Powermapper software, 2010).

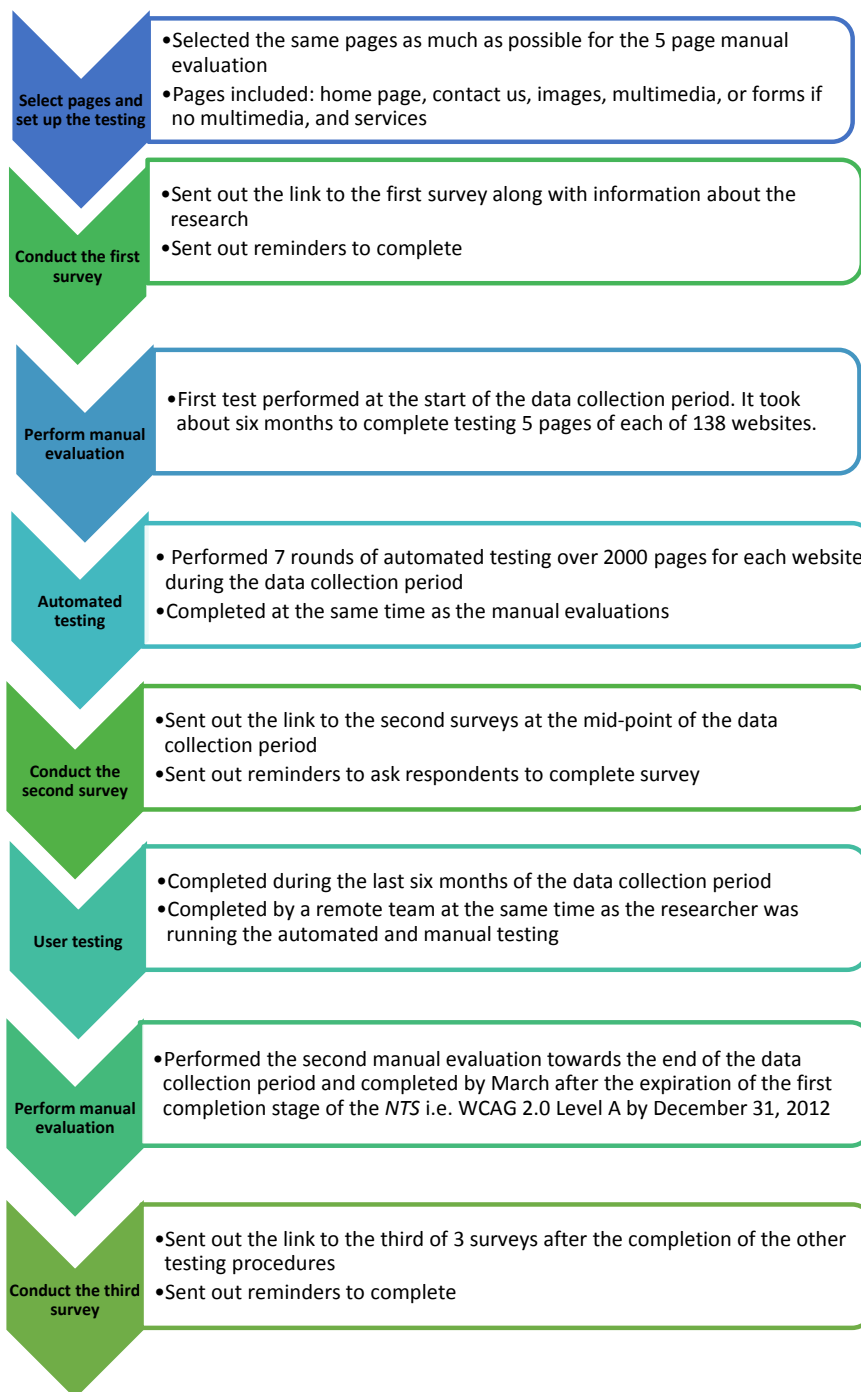


Figure 6-1: Research flow

As demonstrated in Figure 6-1, the manual evaluations were conducted while the automated scans were running, saving some time. Were it not possible for these activities to be carried out simultaneously, the researcher would not have been able to collect a sufficient amount of data in the time allowed for data collection.

While reflective of methodology and research design, this section was included in the discussion to provide an indication of the time required to perform comprehensive website assessments, thereby to provide some background to the challenges faced by large organisations in assessing their websites.

Table 6-1: Total time for data collection

Activity	Time in hours
Selecting the appropriate page from each website (approximately 30 minutes per website x 138 websites)	69
Manual evaluation of 5 pages from each of 138 website (averaging approximately 1.0 hour per page), conducted twice	1380
Automated testing (averaging approximately 5 hours per website) x 7 tests	4830
Surveys sent to 138 email addresses, involved finding email addresses or filling in “contact us” forms to request, making corrections, writing surveys, sending reminders – average 1 hour per website for survey #1, .5 hour for surveys 2 and 3 – a total of 2.0 hours per website	276
User testing of 138 websites by a team of 5 testers at 8 hours per website = 40 hours per website	5520
Total time this would take if run consecutively	12,075 hrs.
At 8 hrs. per day =1509.38 days or 4.14 years	

Table 6-1 demonstrates that the time the data collection would have required, if run consecutively rather than concurrently, would have been more than four years. After four years the results would not have been useful, due to the time-sensitive nature of the research and its close relationship to the NTS.

According to the *WCAG Evaluation Methodology* (World Wide Web Consortium, 2014b) there are five required steps. These include defining the scope of the evaluation, exploring the target website, selecting a representative sample, auditing the selected sample and then reporting the evaluation findings. While some

of the items in each step may be optional, as indicated in Figure 6-1, the basic steps are all required. It is usual for some of the steps to be repeated, so testing should not be regarded as strictly linear. For example, after selecting the sample, different pages may have been located that should have been included and added to the sample. After commencing the audit, it may have been noted that a specific page chosen was too similar to another page in the sample and was replaced.

Exploring the target website includes understanding the purpose of the website, how users interact with it, identifying different templates, identifying different kinds of pages and different web technologies. This step is required so that the evaluator may then be sufficiently knowledgeable about the website's purpose and layout to choose a robust sample for analysis.

In selecting the representative sample, the size of the sample is usually influenced by a number of factors such as the required level of confidence, the size of the website, the complexity of the website, the number of states for pages, the heterogeneity or homogeneity of the website and web page code, the type of technology used in the website, the experience levels of the developers, whether additional detail or pages are required in the sample, and whether the pages are generated from a data repository template which may reduce the required sample size (World Wide Web Consortium, 2014b).

The following diagram provides a visual representation of the steps involved in using *the WCAG Evaluation Methodology*:



Figure 6-2: Flowchart of a website accessibility evaluation

6.1.1 CRITICAL IMPORTANCE OF METHOD SELECTION

The literature review in Chapter 2 provides information about the necessity to use a mixed-methods approach such as selected this research. Additionally, Chapter 5 discussed the problems with sole reliance on automated tests and the data shown there highlights some of the differences in results between manual and automated testing.

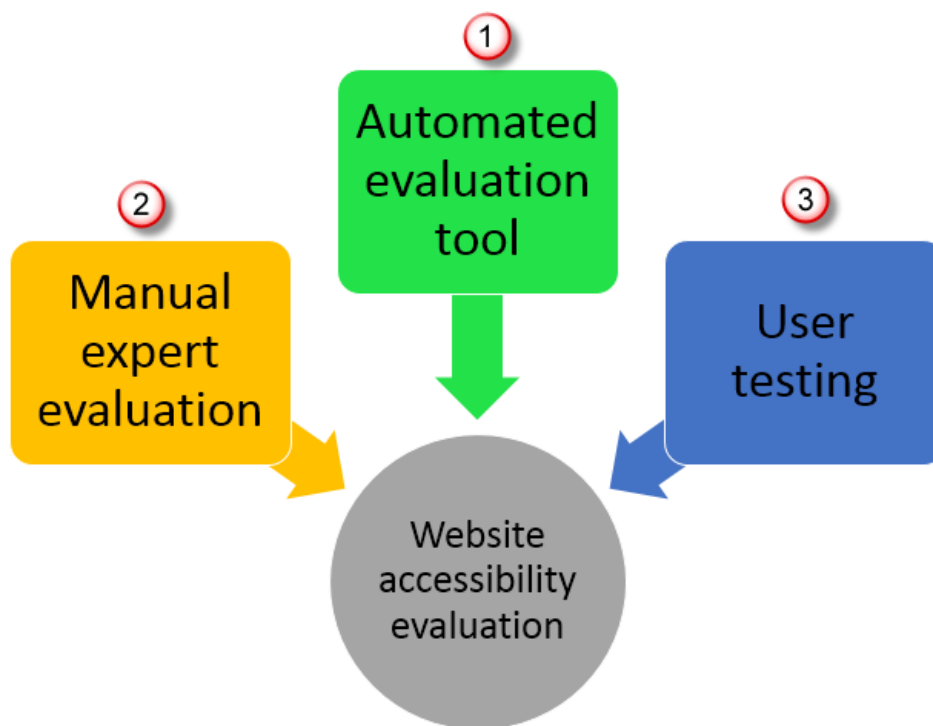


Figure 6-3: Accessibility Evaluation Tools

Figure 6-3 demonstrates the order in which the different testing methods might best be employed in order to perform reviews of accessibility. Each of these testing methods has different strengths and weaknesses. An automated tool is usually employed first and is helpful in locating clusters of errors and, depending upon the tool, may be able to provide a page count and list of the types of pages encountered for example, HTML, JavaScript, PDF, etc. It is helpful to have this information when selecting the page sample for the manual expert evaluation, which then informs the pages selected for testing by users with disabilities.

6.1.1.1 FINANCIAL SUSTAINABILITY OF METHOD SELECTION

Later in the discussion on the benefits and limitations of the different accessibility testing methods, attention is drawn to factors such as time, cost, ease of use, coverage, completeness and correctness. The evaluator and the evaluation commissioner or website owner must often perform a balancing act between the desire to have the most comprehensive and reliable accessibility evaluation and the very real limitations of budget, staff time, expertise, etc. In some cases it might be a case of an automated evaluation of the whole website versus no evaluation at all. Obviously, in such cases, the automated evaluation would be conducted while hopefully the parties understand the limitations this may impose on the usefulness of the data collected.

In performing an evaluation with the hybrid method used in this research, the following three stages would commence with the automated test on the whole website, using the strength of the tool to crawl the website in order to assist the evaluator to choose the right pages for both the manual expert evaluation and the user testing. The evaluator would then use these results to assist in the selection of the most applicable page sample, knowing that the better the page sample selection, the more representative the results will be of the accessibility of the whole website. The results of the manual evaluation may then inform the choice of use cases for the user testing by people with disabilities. If each method is employed correctly, the methodology may work efficiently to provide the agency with the most reliable reflection of its website's accessibility.

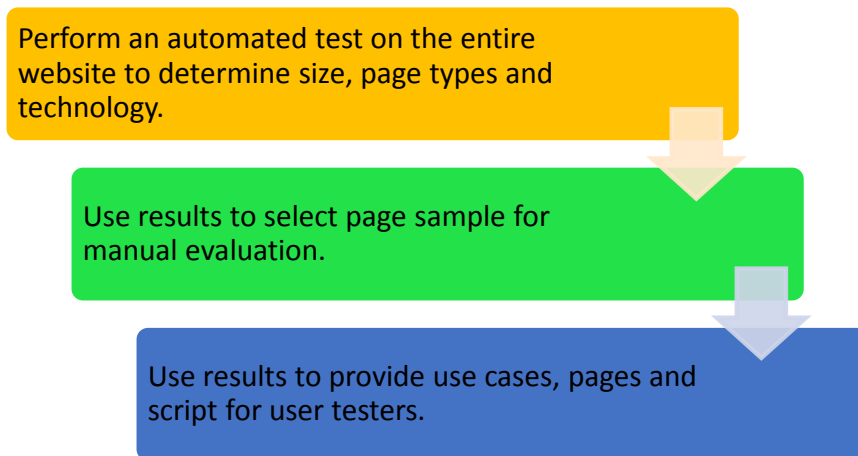


Figure 6-4: Evaluation tools' order of use

The remainder of this chapter deals with a discussion on the data derived from the research and its relevance to the principal and supporting research questions.

6.1.2 INVOLVING EXPERT EVALUATORS

Even with the most robust evaluation, and even if all of the *WCAG* success criteria have been tested, it is still possible that a website might not be accessible for every person with a disability. In fact, people with a variety of disabilities may find that configuring a website to work for one disability may make it more difficult for another disability they must consider. This is often the case with colour customization: what may work for people with dyslexia may make it more difficult for people with colour blindness and someone with both disabilities. For this reason, it is recommended to request the assistance of people with disabilities and senior citizens for additional analysis of the website. This is also mentioned in *WCAG-EM*:

... involving people with disabilities and people with aging-related impairments helps identify additional accessibility barriers that are not easily discovered by the evaluator alone. While not required, it is strongly recommended to involve real people covering a wide range of abilities during the evaluation process (World Wide Web Consortium, 2014b).

A testing method that combines manual expert evaluation with testing by people with disabilities, including senior citizens, is generally considered to be the most reliable method. Manual expert evaluation provides a thorough analysis of the pages in the sample, more effectively than other methods examine web pages against all of the success criteria in *WCAG 2.0*. Typically, evaluators will use some form of assistive technology, such as a screen reader or voice activation software, to test whether any elements on the page would cause a problem for users with those disabilities. The evaluator will also try to access all elements of the page with a keyboard only, using the tab key to see if any element of the page is blocked. One of the most common problems found in this research was accessing video controls such as the stop button and turning on captions and then being able to return to the originating page. When an automatic evaluation tool has been used, the results should be cross-tested by a manual evaluation to ascertain whether violations identified with the tool are in fact actual violations. The expert manual evaluator should be able to recommend strategies to remedy problems located as well as clearly identify the location of the error, for example, providing a screen shot and a clear description of the how the violation occurred. Additionally, the manual expert evaluator should be able to point to “best practice” information to aid the website owner in identifying methods for providing the best user experience. Brajnik (2008), when examining the different evaluation methods determined that this method may be most cost-effective when combined with automatic testing tools. Brajnik also states one of the benefits of a conformance review performed by an expert evaluator is the ability to identify the “defects underlying the checkpoint violations, hence assisting those who have to fix them” (Brajnik, 2008). In another journal paper, Brajnik, Yesilada and Harper (2011) examined the effect of the number of evaluators required to identify all of the violations and also the difference in effectiveness of these methods, depending upon the expertise of the evaluators. They determined that, while three expert evaluators can be relied upon to locate all violations, it would take fourteen non-experts to reach the same result.

While the benefits outlined above are substantial, there are some known limitations to this method. The cost of a manual expert evaluation may be prohibitive, due to the time it takes an evaluator to examine the web page properly. As mentioned above, in order to be most effective the method relies upon skilled evaluators, which increases the cost. In the *WCAG Evaluation Methodology (WCAG-EM)*, under "Required expertise" it states:

Users of the methodology defined by this document are assumed to be knowledgeable of *WCAG 2.0*, accessible web design, assistive technologies, and of how people with different disabilities use the Web. This includes understanding of the relevant web technologies, barriers that people with disabilities experience, assistive technologies and approaches that people with disabilities use, and evaluation techniques and tools to identify potential barriers for people with disabilities. (World Wide Web Consortium, 2014b)

The *WCAG-EM* document reiterates Brajnik's assertion that it is most effective to use more than one evaluator and introduces the idea of review teams. *WCAG-EM* states that "using the combined expertise of review teams provides better coverage for the required skills and helps identify accessibility barriers more effectively".(World Wide Web Consortium, 2014b). While this certainly provides increased accuracy, it also increases the cost of the evaluation as well as the number staff hours required. This researcher found that manually evaluating a single page takes from one to one and a half hours. In a commercial setting, this would increase to approximately three hours per page: time for each evaluator to assess the page, time for the evaluations to be combined or compared and administrative costs. A manual evaluation typically investigates a sample of pages due to the time and cost of assessing every page (Brajnik, 2008; World Wide Web Consortium, 2014b). The increased time and cost involved in using a review team may affect the size of the sample that the website owner is able to afford to have evaluated, thus decreasing the coverage of the evaluation. However, when combined with an automated tool to locate pages with the most violations as well as clusters of violations, along with user testing, a smaller sample of pages for manual expert evaluation may be adequate to provide a robust test.

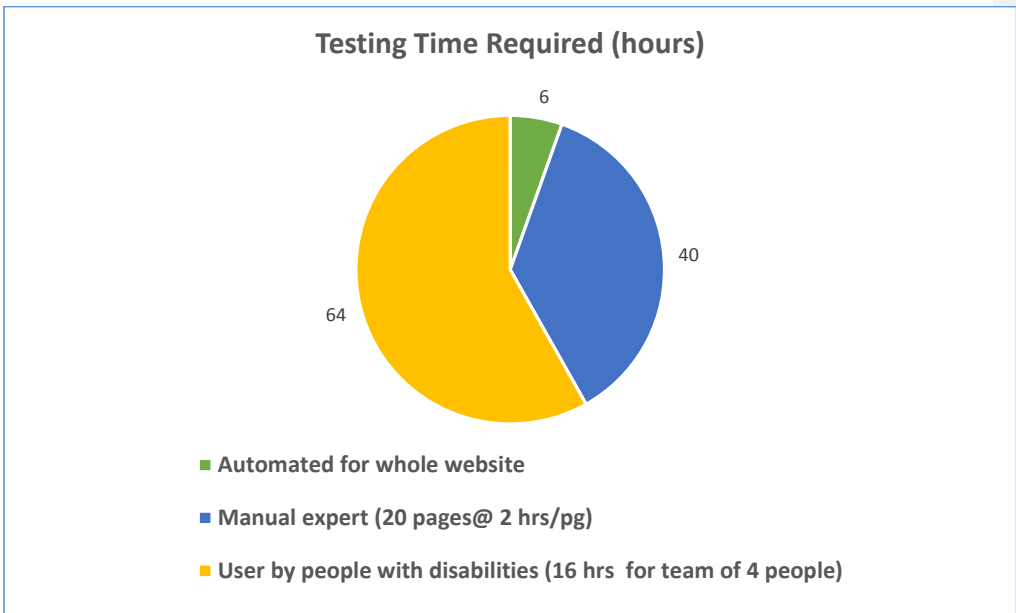


Figure 6-5: Testing required for different methods

The time required for a manual expert evaluation is also a consideration, in addition to the tester costs. The owner may not be able to wait for the results of a full manual evaluation, especially if the website is being tested prior to its launch. It is often the case that accessibility testing is left until the last moment, the assumption being that it will not take significant time. This may result in the website owner not being willing to wait for a manual evaluation, nor allowing sufficient time for the developers to perform the remedial action required following the evaluation. Testing is best carried out from the beginning of the development life cycle and occurring throughout the development of the website. If this is the case, there should not be a requirement for lengthy analysis at the end of the project, alleviating time concerns.

Due to the size of the sample, the time and cost for evaluation, the scope of the evaluation may need to be limited. However, if the *WCAG-EM* approach is used, particularly to locate the best possible sample of pages, it should produce reliable results. Pages included in the sample should include web pages with varying styles, structure, navigation, interaction and visual design, pages with varying types of content such as forms, tables, lists, headings, multimedia and scripting, pages with varying functional components such as date pickers, pages using varying technologies such as HTML, CSS, JavaScript, WAI-ARIA, and pages with dynamic content. (World Wide Web Consortium, 2014b)

6.1.3 HOW BEST TO USE AUTOMATED TOOLS

Considerable attention has been given in the literature review and data analysis to the problems associated with sole reliance on automated tools in evaluating the accessibility of a website. This has been verified in Vigo et al. (Vigo et al., 2013) with the conclusion that the factors of completeness, correctness and coverage are affected by the reliance upon such tools. Brajnik (2008) asserts that using automated tools should not be considered an evaluation method due to the reliance on heuristics in determining violations of several checkpoints. The problem is that the quality of the heuristics may be unreliable and differ widely between tools. (Bradbard & Peters, 2010) “Therefore, using only automated tools is not by itself a viable solution to the problem of evaluating accessibility.” (Brajnik, 2008)

The role of evaluation tools and methods is emphasised by advice provided by W3C’s Web Accessibility Initiative (WAI) in its comments about selecting web accessibility evaluation tools:

Many accessibility checks require human judgement and must be evaluated manually using different techniques. Also, in some cases evaluation tools are prone to producing false or misleading results such as not identifying or signalling incorrect code. The results from evaluation tools should not be used to determine conformance levels unless they are operated by experienced evaluators who understand the capabilities and limitations of the tools in order to achieve accurate results. Web accessibility evaluation tools cannot determine the accessibility of Web sites, they can only assist in doing so. (W3C/WAI Education and Outreach Working Group, 2005)

There are, however, distinct advantages in using automated and semi-automated tools to assist the evaluator in performing their task. *WCAG-EM* states the benefit of automated tools for scanning entire websites in order to assist with the identification of specific pages that should be then evaluated manually (World Wide Web Consortium, 2014b). The W3C source cited in the quotation above, *Selecting Web Accessibility Evaluation Tools* (W3C/WAI Education and Outreach Working Group, 2005), also states that some tools may help the evaluator to understand the structure, navigation and examine the code behind the website. Other advantages include the fact that many tools are available at no or low cost, do not require specific expertise to run, and take significantly less time to perform. (Brajnik, 2008) However, the results do require manual verification, which would again necessitate the services of an experienced evaluator.

In Chapter 4, Data Analysis, it was stated that the automated tool used for this research, *SortSite* (Powermapper software, 2010) was calibrated to test 2000 pages of each website on each of seven occasions over the data collection period. 2000 pages was chosen as the largest website size that could be analysed in the time allowed for data collection. Further research would be required to determine whether this was indeed the optimal number of pages to test and if this truly reflects the overall accessibility of the website. Each of the websites scanned for 2000 pages took a number of hours, but it was possible to load numerous instances of the software and run them at the same time. At times, five instances of the automated tool could

run at the same time, depending upon the computer configuration being employed. On a recent test of a website with 11,000 pages, it took approximately eight hours to test the whole website, which would have precluded testing all of the websites sufficient times for comparison. Depending upon the speed of connection, hardware infrastructure and software capability and licensing, this would preclude many organisations from testing their entire websites. Some websites have in excess of 50,000 pages which makes it difficult to run an automated test regularly on the website. The size of many websites is one of the reasons that the *WCAG Evaluation Methodology* recommends selecting a representative sample for manual testing.

The comparison of the results in Chapter 4 demonstrated considerable differences in the websites evaluated manually and through user testing with people with disabilities. While the manual and user testing show strong similarities, the results are often vastly different from the automated testing.

6.1.4 USING REAL PEOPLE WITH REAL NEEDS

User testing differs from manual expert evaluation in that it is not as concerned with recording violations against standards such as *WCAG 2.0*, but more with issues that affect the person with a disability who is trying to use the website. Many of the issues may be *WCAG* violations, but some are considered to be more concerned with usability than accessibility. The user testers look for large amounts of italic text which poses a problem for people with low vision and also for dyslexic users. Technical audit against *WCAG 2.0* may not identify this issue. They also look at the headings to see if the heading mark-up follows a hierarchical structure which is not “technically” required according to *WCAG 2.0*, but is still considered “best practice.” While a page may pass 2.4.1 “By Pass Blocks” with a properly marked-up hierarchical heading structure, instead of using skip links, the user testers look for skip links for the “keyboard only” testing. This is logical in that keyboard only users are unable to move through the page by headings only in most browsers, although this is slowly changing.

There are many similarities in manual expert evaluation and user testing, partly due to the fact that the testers are often knowledgeable about *WCAG 2.0* and its requirements. In this research, the testers employed work for the Digital Accessibility Centre in South Wales and are expert testers working exclusively in this field. Therefore, their knowledge of the requirements of *WCAG 2.0* is very strong, as is their experience with their own assistive technologies. Each of the testers specialises in one or several areas, such as screen reader software, but may have more than one disability. For example, some testers are both colour blind and dyslexic.

As shown in Chapter 4, the results of the user testing is more closely aligned to the manual expert evaluation scores than to the automated scores. Some of the variations between the user testing and the manual expert evaluations may have occurred because the users were not asked to concentrate solely on the five pages identified, although they knew what these pages were. They were permitted to look at other pages if they

wished and had sufficient time. In each situation they were asked to provide a pass or fail score for each of the criteria they were testing. This also explains some of the differences with the manual scores as the manual evaluation recorded one point for every occurrence of a WCAG violation. If a web page had 20 instances of images without adequate alternative text, it would have received 20 violation points. The violation points were then aggregated and averaged over the five page sample. The users only scored pass or fail for each criterion. Thus, the user testers' score did not reflect the frequency or severity of the violation, just its occurrence.

The importance of user testing was reiterated by Brajnik who, when discussing the role of different accessibility evaluation methods, when comparing evaluation methods for WCAG 1.0, revealed that "45% of the problems experienced by the user group were not a violation of any checkpoint, and would not have been detected without user testing." (Brajnik, 2008). However, Brajnik also points out that user testing can become confused between what is an accessibility and an usability issue.

There was even less similarity between the user testing scores and the automatic testing, probably due to the nature of the scoring, the sample size and the type of testing. The automatic testing also did not reflect the frequency of the violations in the score. If there were 236 violations on 2000 pages tested, the result would state "236 pages with accessibility problems". In checking the accessibility score page, the evaluator would see the number of issues on the 2000 pages, e.g. "35 issues on 2000 pages." It was not readily observable how many pages displayed the same violations. However, with *SortSite*, it was possible to obtain a list of the pages with a specific violation and thence see how frequently that particular violation occurred.

The advantages of user testing include the identification of usability issues for people with disabilities and the ability to prioritise those WCAG accessibility violations that affect different groups of users. User testers were able to describe anecdotally how they were affected by a facet of the website and the frustration or difficulties they faced. Often, they were able to offer a suggestion for an alternative to the feature with which they were experiencing difficulty, such as the way a link was provided or described. Testers are often asked to evaluate user tasks, also known as processes. A complete process is a set of steps, each of which must be completed in order to perform the task. An example of this might be an online shopping cart where a user must view the catalogue, select a product, add the product to the shopping cart, view the shopping cart, select the payment method, and complete the payment. If any of these individual pages is not accessible, the task will not be accessible. In WCAG-EM processes are included in the advice about sample selection: each page of a process must be included in the sample. (World Wide Web Consortium, 2014b)

While there are distinct advantages in including user testing by people with disabilities, it is often difficult to accomplish. One of the problems involves sourcing the testers. Some agencies use distinct groups of user testers, such as those with vision disabilities. These groups may be reflected in the anticipated audience of the website. For example, a website that is designed to provide services for people with hearing disabilities may

recruit testers with hearing disabilities to ensure that the website meets its users' needs. However, organisations with websites not designed specifically for certain groups of users may find it difficult to recruit testers with a variety of disabilities. The services of the Digital Accessibility Centre were used for this research as the Centre operates on a commercial scale. This group of testers has a variety of disabilities, being able to test screen-readers to overcome blindness and low vision, voice activation software for those with mobility problems, and other technologies to counter colour blindness, dyslexia, Asperger's syndrome and other disabilities. Obviously, many organisations may be limited by difficulties in sourcing such a testing group and affording the cost and time required for user testing. The Digital Accessibility Centre is a not-for-profit social enterprise located in South Wales in the United Kingdom. A significant benefit of the Digital Accessibility Centre is its ability to provide employment for people with disabilities. (Digital Accessibility Centre, 2013)

Brajnik describes some of the benefits and problems associated with user testing. While user testing may accurately identify usability problems experienced by actual users, which may pose serious consequences for website users using the same assistive technologies, the method does not identify low-severity problems. (Brajnik, 2008). Although the W3C WAI has devoted considerable attention to involving users in evaluating web accessibility, it stresses that it is important to remember that involving users with disabilities alone is not sufficient to determine if a website is accessible. User testing should be combined with *WCAG* conformance evaluation to ensure that the needs of users with a range of disabilities, and in a variety of situations, are met. (W3C, 2010a)

The testing results and the literature cited above indicate that user testing is a very useful adjunct to testing website accessibility. While user testing is not entirely the same as *WCAG* compliance testing, the methods are complementary. This is emphasised in the W3C documents, including *WCAG 2.0* and *WCAG-EM*.

As far as the outcomes of the *NTS* are concerned, the methods that agencies used to assess their own websites and to report their progress influences the results. For example, if an agency used some form of automated testing, without manual evaluation or user testing, the findings would differ from the results achieved if it had used a hybrid method like that used in this research. It will be difficult, if not impossible, for the authors of the *NTS* to compare results when a variety of evaluation methods have been implemented. This is related not only to the principal research question about the outcomes of the *NTS*, but also to the supporting questions which examine the critical success factors for organisations which achieve compliance. A robust and consistent mixed evaluation methodology will produce more dependable results than one that relies solely on one method. The other question that the authors of the *NTS* need to consider is whether government agencies have the skills in-house to perform reliable assessments of their websites. The validity of results from in-house evaluations should be checked by comparison with third-party evaluations, and even then the expertise of the evaluator or team of evaluators must be carefully considered. An evaluation which follows a reputable methodology, such as the *WCAG Evaluation Methodology* should provide a reliable and replicable

result.(World Wide Web Consortium, 2014b). Although the *WCAG Evaluation Methodology* is still in public working draft form, it is anticipated that when it is formally adopted it will provide a reliable process. Whether this *Methodology* or some other is followed, using a proven methodology will contribute to the critical success factors for organisations which wish to achieve *WCAG 2.0* compliance.

6.1.5 UNDERSTANDING ATTITUDES

Supporting question three was designed to examine the critical success factors for organisations which achieved compliance with *WCAG 2.0*. While none of the websites tested reached complete compliance, a number came very close, including FD4 and FD12. In order to determine any contributing success factors, the researcher examined their survey answers for information. Survey questions asked about the respondents' perceptions of their ability to meet the *NTS* deadlines and their level of compliance with *WCAG 2.0*. These results were also discussed in Chapter 4.

These surveys posed questions designed to determine which obstacles faced by organisations are considered barriers to them achieving *WCAG 2.0* compliance. The researcher paid particular attention to websites which performed the best and the worst in the manual and user testing.

Three federal government websites, FD4, FD 6 and FD12 were among the best-forming group. The FD4 respondent stated that their agency's website had been audited by an external audit method within three to six months of the first survey, at the beginning of the data collection period. While no claim of full compliance was made, the respondent reported that most pages were *WCAG 2.0* AA compliant. However, some pages still required work to meet that level of compliance. The organisation had developed a methodology for checking its website. It used a number of automated assistant tools, such as the WAVE accessibility toolbar and Firebug and 10% of the site had been checked for compliance. It was stated that the agency had developed in-house skills and methods for conducting periodic audits. In this organisation, an individual was responsible for the website accessibility process. The respondent reported that the agency was aware of the compliance requirements, the *NTS*, W3C and *WCAG 2.0* and the different tools available for checking accessibility. The respondent stated that the most problematic issues were large numbers of PDF documents that would be too costly to make fully accessible, and the education of document authors using MS Word. This respondent understood that the most critical issues relating to website accessibility in Australia were awareness of the standards and the reasons for making websites accessible. According to this respondent, barriers to accessibility compliance included time, cost and management support. The organisation's plan for PDFs was that it would provide alternative formats for all PDF documents. The respondent also stated that a variety of user groups would benefit from an accessible website and that following *WCAG 2.0* guidelines was the best method for meeting the needs of these users. Finally, the respondent stated that the *NTS* had provided the impetus to address website accessibility.

Respondents from FD6 and FD12 appeared to have a strong awareness of the guidelines for Australia, the W3C and the *NTS*. Critical issues for their organisations included internal capacity to create accessible pages, templates and controls, the ability to create accessible content and the capability to conduct robust conformance testing and the capability to provide services to external users. Critical issues in Australia included insufficient understanding of *WCAG 2.0* within the developer community, absence of real understanding of the *DDA* and the *Advisory Notes* and insufficient resources to address issues within a reasonable timeframe. One of the respondents reported that the agency's website had been audited more than a year ago, before first survey, to an unknown standard and with an unknown result. The respondent explained the testing was only minimal, to substantiate several instances of inaccessibility. The agency's future plans included building internal capability and incorporating testing into the website life cycle. Barriers to compliance included time, cost, technical ability and staff availability. One respondent report that the agency planned to treat PDFs as websites and to require conformance to *WCAG 2.0* Level A by December 2012. As with FD4, the organisation believed that the *NTS* had provided the necessary impetus to address website accessibility.

Website NFP9 was one of the websites which had the lowest test scores. However, a respondent stated that the organisation had a strong understanding of *WCAG*, the *NTS*, and W3C. Its websites does not come under the *NTS* and that staff are not working toward *WCAG 2.0* compliance. This respondent stated that the organisation is currently redeveloping its website. The most critical issue was the need to incorporate and maintain industry-level accessibility standards for the life-cycle of the website. In Australia, the most critical issue facing website accessibility was incorporating accessibility with usability. The respondent was aware of the accessibility tools. While this website was quite inaccessible, it was undergoing a website accessibility audit at the time of the survey. The current website was compliant to *WCAG 1.0* to Level A. The previous audit was not verified as to method or level, but the next audit would be out-sourced. The organisation was not likely to be able to reach *WCAG 2.0* to Level A by December 2012. The chief barrier was that the web redevelopment was not due to be completed until April 2013. No decision about how to deal with PDF documents had been made. However, the organisation had been influenced by the *NTS* to work towards website accessibility.

COR1 was the most inaccessible of the corporate website category. The responses from the respondent who spoke on its behalf were indicative of the accessibility of their website. Neither agreement nor disagreement was made with survey statements about the *NTS*, *WCAG 2.0* or the W3C. The respondent specifically stated that there were no critical issues regarding website accessibility for the organisation or for website accessibility in Australia. It was stated that the organisation was aware of the accessibility tools available. This website had been audited more than a year ago, to an unknown standard, reaching an unknown compliance level and the method was not verified in any way known to the respondent. Future plans included meeting minimum requirements as a part of a website redesign process. There was neither agreement nor disagreement with any

statements regarding ability to meet current Australian time guidelines. According to the respondent, chief barriers included time, cost, and available staff. While the organisation was experiencing difficulty understanding WCAG 2.0 Level A requirements, the respondent was not able to describe the most difficult technical issue being faced. While staff were aware of the issues presented by PDF documents, they have not yet made a decision about how to deal with them. When asked about how the organisation plans to meet the needs of the user group identified as most likely to benefit from its accessible website, specifically older users with impaired vision, it was stated its approach was likely to be “business as usual.” Perhaps the most logical interpretation of this less than ambiguous answer is that there are no plans to meet their users’ needs.

There are some obvious differences between the responses to the surveys from the most accessible and least accessible of the websites. There appears to be a maturity of understanding from the most accessible websites who place a strong importance upon building internal capability for creating and testing content, and a clear methodology for testing their content on a regular basis. Comments stating that a corporate organisation would use a “business as usual” approach to meeting the needs of its users is of particular concern as it indicates that the issue of website accessibility is not receiving attention at a senior management level.

In general, respondents indicated a good understanding of the issues of website accessibility, particularly as they applied to their organisations’ websites. The open-ended questions which solicited anecdotal comments were well used and this information has been summarised in the discussion. Not surprisingly, the respondents identified issues that made complying with the deadlines difficult, mainly time, cost, and staffing requirements.

Some respondents identified requiring more senior corporate support for the work of ensuring the accessibility of the website. Looking at the responses of the most inaccessible websites, there is a greater need to emphasise the importance of accessibility within an organisation which is best provided by a high level of corporate support, a view supported by Bruyère et al. (2010):

Successful disability management programs, as with most business practices, are most effective when they are built into an organisation’s culture. Having support from all levels of an organisation, starting with top management, is imperative. (Bruyère, von Schrader, Coduti, & Bjelland, 2010, p. 56)

From the data gathered, one of the critical success factors discussed in supporting question three, is the requirement for corporate support. From both the audit data and the responses from the surveys, websites can be roughly classified into four basic categories of understanding and commitment as outlined below:

Knowing and Doing

This relates to website owners who are aware of WCAG and the NTS and are trying to meet their requirements. Websites which might fit into this group are many owned by federal government departments, who have been clearly informed of the requirements of the NTS, have made it their responsibility to understand the repercussions of WCAG 2.0, and have made definite steps toward compliance. Examples in this group include websites FD4, FD9, FD11, FD16, SG15, SG39, LG1, and COR20. All of these websites scored in the top rankings of manual and user testing and demonstrated understanding of the requirements in the survey responses.

Knowing and Planning

This category relates to those website owners who are aware of WCAG and the NTS and state they are planning to work towards compliance, but so far have made no concrete steps towards compliance. Looking back to Figure 5-1, it is evident that most organisations indicate they know the requirements, and generally know whether they are included in the NTS. However knowledge does not translate directly into the audit results. It seems apparent from the surveys that a number of these organisations are making plans to work toward compliance and that this would be reflected in future website audit results conducted at the completion of the NTS.

Not My Problem, or Blissful Ignorance

This categorisation applies to those agencies who fail to realise that they are subject to the NTS and therefore feel no urgency to improve their accessibility. This category includes some of the organisations which are included in the NTS but have not made any plans to assess their websites for compliance. Of the 1398 websites covered by the 2012 Progress Report of AGIMO, 481, or 41.4%, have not been assessed. 11% of this group are due for decommissioning or archiving before the 2014 NTS deadline and 14.5% are reported as having a high or medium priority for upgrading. This leaves a considerable number, 15.9%, which have not been assessed and are neither scheduled for upgrading nor due for decommissioning.

Unknowing and Uncaring

This category of respondent applies to those who are not particularly aware of accessibility issues, and do not seem to care to know about the issues or their impacts on people with disabilities. This group includes websites which received the lowest scores in the manual and user testing and for which the survey responses indicate an attitude of indifference. Websites in this category would include mainly corporate and not-for-profit websites and, surprisingly, one federal website, FD14. Website COR1 is an obvious example of the attitudes of this group. COR1's website managers are not planning to do anything beyond "business as usual"

to meet the needs of affected users. It also was scored among the lowest of the manual and user testing of websites.

While these categories are a simplification of the attitudinal data conveyed by the survey respondents, they do consistently mirror the audit data and the general trends of accessibility research found in the literature.

6.2 ACCESSIBILITY VS. USABILITY

Confusion is common between the definitions of “accessibility” and “usability.” One definition of “accessibility” is that it is “usability for people with disabilities.” While usability relates to the ease with which users can accomplish necessary tasks through a website, accessibility relates more to the ability of people with disabilities to perform the same tasks. It is possible that a website that meets all of the *WCAG 2.0* criteria may not meet all of the needs of a person with disabilities. The introduction to *WCAG 2.0* states:

Although these guidelines cover a wide range of issues, they are not able to address the needs of people with all types, degrees, and combinations of disability. These guidelines also make Web content more usable by older individuals with changing abilities due to aging and often improve usability for users in general. (W3C, 2008d).

A conformance check of a website to *WCAG 2.0* requires checking it against all the success criteria to ensure that each criterion is met. Under *WCAG 2.0*, each page must meet all of the *WCAG 2.0* success criteria in order to claim full compliance. Under the *WCAG-Evaluation Methodology (WCAG-EM)*, a sample of pages is checked to predict reliably the accessibility of the website as a whole. It does not make conformance claims about the whole website, but rather the subset of the pages chosen for that sample. If the sample was the whole website, a compliance statement could be made. During a conformance check, the testers would typically employ assistive technology and known practices of users with disabilities. For example, they would normally use some type of screen reader and work through the page to ensure that they can access all of the controls and that the alternative text for images makes sense when read out loud. They would also try to use the website without a pointer-device, such as a mouse, to check the same features. However testers, while knowledgeable about how to use assistive technology and how people with disabilities use the Web, do not usually face such restrictions. In effect, they can “cheat” if they get stuck. They might open their eyes or turn on the monitor if they were using a screen reader and became lost. They could use a mouse to position their focus on a link if they could not manage it by keyboard only. Another important factor is that an evaluator who uses assistive technology is not usually an expert in the use of that technology. Rather they usually have a sound working knowledge of that software. The user testers who rely on screen readers every day will know the shortcuts and special features that enable them to customise the tools for their own use.

An usability check is usually performed by a group of user testers, preferably including people with disabilities and senior citizens. *WCAG-EM* and material obtainable from *WCAG 2.0* and the WAI website (W3C, 2008d,

2010a; World Wide Web Consortium, 2014b) all refer to the importance of working with people with disabilities and senior citizens to ascertain websites' usability for those using their particular assistive technologies. In other words, it is important to ensure the accessibility of websites for the particular needs of these groups.

It is also important to note that, while testing by people with disabilities is important, it is not sufficient in itself to make *WCAG 2.0* compliance claims. People with disabilities may state whether a website meets their needs or whether it poses accessibility problems for them. For example, a blind user who is performing testing remotely for an organisation using a screen reader may not know a video is on a page if there are no accessible controls. Without sufficient information, they may assume that the page is completely accessible, not knowing they have missed important information or features. Such testing is most reliably carried out in a controlled environment where there is assistance to record difficulties and where someone can observe the behaviour and results for the user tester (Mankoff, Fait, & Tran, 2005).

The difference between accessibility and usability testing is further highlighted in the study conducted by Rømen and Svanæs (Rømen & Svanæs, 2012). When testing, using both *WCAG 1.0* and *WCAG 2.0*, researchers discovered that testers with disabilities located a surprisingly small number of the identified accessibility violations, i.e. 27% and 32% of identified issues respectively. However, the researchers stated that most of the issues were not strictly *WCAG* issues:

Given enough time and patience, the visually impaired users in the test would eventually have found the right links, the motor-impaired would have hit the small buttons, and the dyslectic users would have deciphered the link texts. But they did not, and that is what usability is all about: the actual problems that real people experience with real systems. That is also what accessibility should be about. It is therefore recommended that WAI expands the definition of accessibility to include "usability for all" in accordance with ISO. (Rømen & Svanæs, 2012); (ISO, 2006)

A study by Loiacono and Djambasi (2013) found a direct link between accessibility testing and user testing. Their results show that the more usability testing is performed by a company, the more accessibility testing that company performs.

...the gathered results indicate that companies are more likely to conduct website accessibility testing if they carry out usability testing, then it makes sense for companies to enhance their level of usability testing and thereby accessibility testing as well.

6.3 TRENDS

Several trends have been noted during this research, outside the research questions.

One of the trends discussed previously is the close relationship between manual expert evaluation and user testing. These two methods are complementary, as noted above in the discussion of usability and accessibility. The data further illustrates the different results obtained with automated tools and provides further indication of the need to have a multi-faceted approach when conducting website evaluations to determine their accessibility. Earlier in this chapter attention was drawn to some of the benefits of automated testing and how it can be incorporated into this multi-faceted approach to enhance the overall testing methodology.

Another trend was the higher overall accessibility of Government websites at the start of the data collection period, which remained more accessible than the non-government group at the end of the data collection period. This relates to supporting question one, which asks whether the type of organisation played a role in the overall accessibility of the websites. The surveys demonstrated that the more accessible websites had a greater awareness and maturity in their view of website accessibility and its importance.

There was also a much higher number of accessibility violations in the perceivable and operable principles in the manual evaluations than in the other principles, even considering the higher number of success criteria in these principles. Websites classed as least accessible in both the manual expert and user testing results provide evidence of a much higher incidence of parsing or validation errors.

6.3.1 IMPACT OF TECHNOLOGY

During the course of this research, a number of technological changes have taken place in Australia and internationally. These include the introduction of ARIA, the increasing acceptance of HTML 5 and CSS3, the work on the *WCAG-EM*, and the advancement of a number of technologies in their status as W3C documents, such as the guidance on applying *WCAG 2.0* to non-web ICT.

This thesis has been designed as a technologically-agnostic study because of the similar design of both the *NTS* and *WCAG 2.0* which are supported by the associated non-normative documents, [Understanding WCAG 2.0](#) and [Techniques for WCAG 2.0](#). Although these documents do not have the normative status of *WCAG 2.0*, they provide information important to understanding and implementing *WCAG*. Therefore, the impact on various technologies has not formed a part of the study. For example, it did not examine how many pages in the sample employed JavaScript or Silverlight. However, due to the Australian Government's stance on the requirement to provide an accessible alternative for every PDF document, the penalty structure for these documents without an accessible alternative was applied. This was discussed in Chapter 4 in the data analysis and the results demonstrated that for most websites their overall ranking was not affected. Websites that had

high numbers of penalties also had high counts of accessibility violations, resulting in fairly static rankings. There were some exceptions to this generalisation and they are provided in Chapter 4.

When a website’s design incorporates features such as JavaScript, different technological challenges are encountered and the count of violations will often be much higher than for a static informational website, especially until the accessibility has been tested and remediation efforts completed. Often when websites include features such as multimedia, slide carousels, complex and dynamic menu structures, and complicated forms and tables, they are also likely to have more accessibility challenges than the aforementioned static informational websites. However, analysis of the implication of use of, and relationship with, sophisticated accessibility techniques is not within the scope of this research.

WCAG 2.0 is a normative document which has not been amended during the research period. However, new technology acceptance and techniques are continually provided and are included in the *Understanding WCAG 2.0* and *Techniques for WCAG 2.0 (W3C, 2010c)*. These are informative documents provided by W3C in order to assist website owners or developers to find methods for maintaining a website’s accessibility:

WCAG 2.0 is supported by the associated non-normative documents, *Understanding WCAG 2.0* and *Techniques for WCAG 2.0*. Although those documents do not have the formal status that *WCAG 2.0* itself has, they provide information important to understanding and implementing *WCAG*. (W3C, 2008d)

During the manual evaluation, as the researcher needed to check the mark-up language validation in order to determine if *WCAG 2.0* success criteria 4.1.1, parsing, was satisfied, the decision was made to record the mark-up language used for the page. In the analysis, the researcher examined the mark-up language that was used across each of the five pages manually evaluated to determine if there is an increase in the prevalence of one mark-up language and if that was reflected in the manual evaluation results. In Table 6-2 the mark-up language frequency across the five pages assessed is represented as a mean of the occurrence for each language. For example, XHTML 1.0 was the most common language found on all pages in both evaluation #1 and #2.

Table 6-2: Mark-up Language Count

Markup	Evaluation #1 - of count for 5 pages					Evaluation #2 – mean (\bar{x}) of count for 5 pages				
	Pg 1	Pg 2	Pg 3	Pg 4	Pg 5	Pg 1	Pg 2	Pg 3	Pg 4	Pg 5
HTML 4.0	0.72	0.72	0.72	0.72	0.72	2.17	1.45	1.45	2.17	2.90
HTML 4.01	15.21	15.21	14.49	17.39	15.94	11.59	12.32	9.42	13.77	13.77
XHTML 1.0	63.77	63.77	65.94	58.70	60.87	54.35	55.80	62.32	52.17	47.83

XHTML 1.1	2.90	1.45	2.17	0.72	1.45	2.17	2.17	2.90	1.45	2.17
XHTML+RDFA	1.45	1.45	1.45	0.72	0.72	2.17	2.17	1.45	0.72	1.45
HTML 5	10.87	11.59	10.14	15.22	13.04	23.91	22.46	20.29	26.09	24.64
UNKNOWN	5.07	5.80	5.07	6.52	7.25	3.62	3.62	2.17	3.62	7.25
Total	100	100	100	100	100	100	100	100	100	100

Table 6-2 demonstrates that reliance on HTML 4.0 has increased, while that on HTML 4.01 has decreased. Reliance upon both XHTML 1.0 AND 1.1 have both decreased, with XHTML 1.0 decreasing markedly, though from a very high base, making up two-thirds of the pages viewed. The most notable increase has been in HTML 5 where the mean use across all pages has increased by approximately 200% between the same pages for Evaluation #1 to Evaluation #2, a period of approximately eighteen months.

However, the increase in the use of HTML5 did not translate into a decrease in accessibility violations, as was demonstrated in Chapter 4 with the analysis of the data. The research recorded the number of validation errors and warnings as well as the mark-up language employed. Only the actual validation errors are provided in Table 6-3.

Table 6-3: Validation Summary

Category	Evaluation #1					Evaluation #2				
	Pg.1	Pg.2	Pg.3	Pg.4	Pg.5	Pg.1	Pg.2	Pg.2	Pg.4	Pg.5
Mean=	42.91	37.96	50.59	44.69	43.99	46.6	34.88	38.38	49.48	42.99
Federal Gov.	41.13	40.64	42.69	40.71	64	41.81	34.87	34.20	42.08	41.07
State Gov.	51.58	23.51	25.38	61.56	60.46	52.42	23.59	27.9	48.43	70.56
Local Gov.	21.83	46.3	52.92	15	24.45	33.17	32.17	27.18	32.33	23.9
Gov-Affil.	34.4	41.78	39.1	23.4	28.3	28.9	13.5	20.4	17.9	35.4
Not-For-Profit	28.78	28.13	47.56	49.38	42.29	39.11	41.67	28.78	48.89	39.89
Corporate	79.74	47.4	95.93	78.09	44.45	84.18	63.49	91.8	107.23	47.13

While not every violation error is considered to be a WCAG violation, due to time constraints these were not separated into those that were or were not accessibility violations. In WCAG 2.0(W3C, 2008d) under the robust principle, SC 4.11 Parsing, the validation errors that are classed as accessibility violations include those that do not:

- Have missing start and end tags;
- Have content that is incorrectly nested according to specifications;
- Contain duplicate attributes; and
- Do not contain non-unique IDs, except where allowed.

However, it is considered good practice to have code which validates against the W3C-provided validation tool. Table 6-3 demonstrates that the corporate category had validation errors far in excess of all of the other categories, with the local government websites possessing the lowest number of violations. As the corporate category was also considered by the manual expert evaluation and user testing to have the poorest accessibility, the mark-up language validation may prove to be a general indicator of the accessibility level. While this hypothesis requires further analysis, Table 6-4 explores the relationship of mark-up language to overall accessibility according to the manual evaluations. The predominant mark-up language is XHTML 1.0, however HTML5 is rapidly gaining in popularity.

Table 6-4: Validation comparison - most and least accessible

Category	Evaluation #1					Evaluation #2				
	Pg.1	Pg.2	Pg.3	Pg.4	Pg.5	Pg.1	Pg.2	Pg.2	Pg.4	Pg.5
Mean=	42.91	37.96	50.59	44.69	43.99	46.6	34.88	38.38	49.48	42.99
Most accessible websites										
FD4 (1)	0	0	0	0	0	2	2	0	3	1
SG15 (2)	n/a	5	1	1	1	5	10	6	5	6
FD12 (3)	25	8	18	3	8	3	3	3	3	7
LG1 (4)	6	269	23	3	4	2	32	2	53	n/a
COR13 (5)	4	0	11	4	4	4	6	11	4	4
Least accessible websites										
COR1 (133)	157	123	105	32	129	144	123	105	26	116
COR45 (134)	580	268	275	2119	361	428	290	246	303	n/a
NFP1 (135)	3	16	16	16	16	12	24	24	24	16
NFP9 (136)	108	157	236	132	196	110	154	24	192	193
COR5 (137)	111	190	n/a	n/a	n/a	614	622	n/a	693	639

In some cases, it was not possible to evaluate a website, such as SG15, for the first page in evaluation #1. In these cases, the website was not able to be parsed due to either difficulty with the online W3C validator at the time or with access to the website. In most of these cases, the validator stated that the website could not be parsed at that time.

Looking at the websites considered to be the best websites according to the manual evaluations, shown in Table 6-5, and comparing the mark-up language validation errors, the validation errors, with the exception of website LG1 are all at the very low end. The validation errors for the websites that were gauged as the most inaccessible mainly had very violation high counts, with the exception of NFP1.

Table 6-5: Markup language for the most and the least accessible

	Mark-up, predominant or changing.	Constant or changing.
Most accessible websites		
FD4 (1)	XHTML 1.0 Transitional	constant
SG15 (2)	XHTML 1.0 Strict / XHTML+RDFa	changing
FD12 (3)	XHTML 1.0 Transitional	constant
LG1 (4)	XHTML 1.0 Transitional	constant
COR13 (5)	HTML 5	constant
Least accessible websites		
COR1 (133)	XHTML 1.0 Strict	constant
COR45 (134)	HTML 4.01 Strict	constant
NFP1 (135)	XHTML 1.0 Transitional	constant
NFP9 (136)	XHTML 1.0 Transitional	constant
COR5 (137)	XHTML 1.0 Transitional	constant

Table 6-5 demonstrates that the most accessible websites employed XHTML and had not, at the date of data collection, commenced migrating to HTML5. Further analysis of the mark-up language shows that 76.81% of the websites maintained a constant mark-up language through the five pages in Evaluation #1 compared with 62.32% of the same pages in Evaluation #2. This indicates that the websites are in a state of change, with the information above demonstrating that this is largely related to the increase in popularity of HTML5 at the expense of XHTML 1.0, shown previously in Table 6-2.

6.3.2 CHANGING NATURE OF WEBSITES

As might be expected, some of the websites undertook major upgrades or, in some cases, completely new websites were created during the data collection period.

One example is website FD6 which released a completely new website immediately after the completion of the data collection period. While this website ranked 8 in Evaluation #1, and deteriorated to 12 in Evaluation #2 of the manual evaluations, an analysis of the new website provided in Table 6-6 shows substantial improvement.

Table 6-6: Findings for new website - FD6

	Evaluation #1	Evaluation #2	Informal Evaluation #3
Total	82	102	10
Mean (5 pages)	16.4	20.4	2

The only errors noted in the third informal evaluation relate to the visibility of the skip links and validation errors. Although, in the first two evaluations, this website ranked 8 and 12 respectively, if the new website had been released before the second evaluation, it would have ranked in the top 3 websites, not only of the federal government websites but for the whole target group. However, these results are not reflected in the data analysis as the deadline for *NTS WCAG 2.0* Level A compliance was December 31, 2012.

In the manual evaluations, a number of websites no longer offered the pages selected for the first evaluation. Alternate pages had to be chosen which reflected the initial criteria as closely as possible. However, in all cases where a single page was no longer available the other pages were the same. Hence there were no appreciable changes in the evaluation results averaged across the five pages tested.

In another case two of the websites were slowly being decommissioned, to be replaced by a new website that was to be an amalgamation. The manual evaluations examined the two websites separately and the automated tests included the new website after its launch, as did the user testing. This was due to the fact that the amalgamation happened well into the data collection period.

6.3.3 COMMONALITIES BETWEEN IMPROVING WEBSITES

Of the thirty six websites which demonstrated an improvement in the manual evaluations, it is noteworthy that only ten of the websites were non-government. This was disproportionate to the target sample demographics, which indicated that 58.7% of the sample was comprised of government websites including government-affiliated. This demographic percentage can be compared with the fact that 72% of those websites which improved were government websites. This reverts to supporting question 1, whether the type of organisation played a role in the accessibility testing results. From this analysis, the government websites began as, and remained, the more accessible of the two groups, with the federal government websites consistently scoring the highest in both evaluations

Manual evaluations #1 and #2 averages across the five pages tested, shown in Table 6-7, were taken without the penalties that were imposed for critical WCAG violations and the provision of PDF documents without accessible alternatives. It is noteworthy that the imposition of the penalties did not change the ratings noticeably. Accordingly, it may be inferred that improvements in the websites' ratings were not directly related to either of these issues. The improvements were found to occur across all categories and implied a genuine improvement in the accessibility of the websites over the research time period.

Table 7-1 shows that many of these improved websites also met, or nearly met, the WCAG A or AA compliance levels. Considering the survey responses of organisations which improved over the data collection period and the best-performing websites, it is possible to see a commonality with the websites for which respondents expressed a good understanding of accessibility issues and difficulties, and indicated they were working on their website's accessibility.

Table 6-7: Websites showing improvement in manual evaluations

Website	Manual Evaluation #1 Average	Manual Evaluation #2 Average	Percentage of change
Federal Sites:4 or 23.53% of category			
FD4	3.8	1.8	52.63%
FD5	16.4	9.6	41.46%
FD11	8.4	7.2	14.29%
FD12	7.8	3	61.54%
Government Affiliated:4 or 40% of category			
GA2	52.2	49.8	4.6%
GA3	19	13	31.58%
GA7	35.2	24.2	31.5%
GA8	24.4	21.2	13.11%
Local Government:2 or 16.67% of category			
LG1	27.2	3.8	86.03%
LG8	15.8	15.6	1.27%
Not-for-profit:2 or 22.2% of category			
NFP7	39.2	31.2	20.41%
NFP9	96.2	94.6	1.66%

State Government:21 or 50% of category			
SG5	18.2	16.8	7.69%
SG6	21.8	17.8	18.35%
SG10	21.2	16	24.53%
SG11	22.8	22.4	1.75%
SG15	4.4	3	31.82%
SG17	35.8	21.8	39.11%
SG18	13	12.4	4.62%
SG19	30.6	17.6	42.48%
SG21	15.6	14.6	6.41%
SG24	21.8	20.8	4.59%
SG26	21.8	21.2	2.75%
SG29	13.6	13.2	2.94%
SG30	25.6	24.4	4.69%
SG31	47.6	16.2	65.97%
SG34	58.2	42.6	26.8%
SG35	36.6	25.4	30.60%
SG38	33.2	32.4	2.41%
SG39	15.2	7	53.95%
SG40	48.4	44.6	7.85%
SG41	43.6	42.8	1.83%
SG42	21.6	14.8	31.48%
Corporate:11 or 22.92% of category			
COR9	54.4	51.6	5.15%
COR11	16.4	14.8	9.76%
COR13	5.6	5	10.71%
COR18	34.4	32.8	4.65%
COR21	13.6	8.2	39.71%
COR26	21.6	20.6	4.63%
COR35	27.6	21.2	23.19%
COR36	99.2	56.4	43.15%
COR38	83.6	72.6	13.16%
COR42	73.8	69	6.5%
COR48	80.8	72.6	10.15%

Tables 6-7 and 6-8 show that 31 of the government websites improved, compared to 13 of the non-government websites. Earlier it was mentioned that the government category comprised 58.7 of the target sample and that the non-government comprised 41.3% of the sample, with government-affiliated being included with the government category.

Table 6-8: Comparison of government vs. non-government websites which improved

Category	Number improved	Percentage of category that improved
Government	31	38.27
Non-Government	13	22.81

Table 6-8 displays the disproportionate percentage of websites that improved in each government and non-government category. Furthermore, of the sixteen websites that improved by more than 25%, only two were in the non-government category.

When considering the hybrid evaluation method used for this research, if the manual expert evaluation had not been one of the tools, the results would have been very different. As mentioned previously, the automated testing should be used in conjunction with other methods, as it has definite strengths to complement other testing methods rather than being reliable on its own. From the comparison of website rankings in Tables 7-2 and 7-3, it may be observed that the ranking of websites from the manual expert evaluation and the user testing are quite similar, while the automated results are markedly dissimilar.

If time had permitted, testing entire websites with the automated tool may have increased or decreased the differences between the types of testing results. However, this would have presented another problem in that the websites would all have presented a different number of pages, which would mean the need to rely on the percentages shown in these results.

It was expected that due to the impetus from the *NTS*, the results would show that the federal government websites improved at a faster rate than other categories. Although this was not clearly evident, due to a few websites in each of the categories either performing much better or much worse than others in the same category, not only did the federal government websites begin by being more accessible, they remained in this position.

6.3.4 METHODS FOR SELF-EVALUATION

Questions were presented in all three surveys to determine how recently, if at all, websites had been evaluated, the methods, chosen, internal or external, and the current level of compliance, i.e. *WCAG 1.0 A* to *WCAG 2.0 AAA*.

In each of the three surveys, respondents were asked about their current levels of compliance. Of the seventeen respondents who answered this question in the final survey, Figure 6-6 demonstrates that six respondents stated they had met *WCAG 2.0* at Level A, and six respondents stated they had met Level AA.

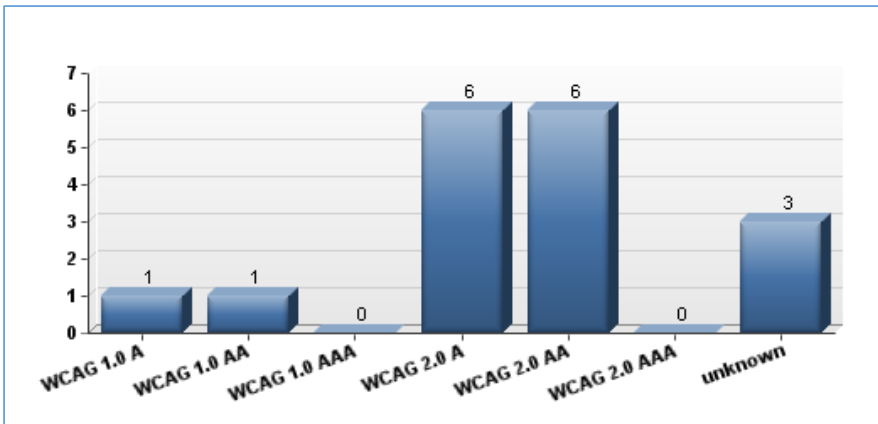


Figure 6-6: Survey 3: Compliance Statements

Looking ahead to Table 7-1, according to the manual assessments, these self-certification attempts are not accurate. However, it is not unusual for website owners to make incorrect declarations about the accessibility of their websites. This is corroborated in a study commissioned by ANEC in Belgium. The study examined 100 websites, where half were carrying accessibility logos from recognised organisations and half were self-declared.

All of the manually tested website pages showed some evidence of accessibility awareness and best practice. Three certified government and public body websites passed all or all but one of the Level A success criteria, and a further three had four or less failed checkpoints. None of the self-declared government and public body websites passed all criteria and only three had four or less failed checkpoints. The remaining third (3 certified and 5 self-declared) showed some evidence of meeting accessibility guidelines but failed between six and eight different checkpoints which included basic issues affecting perception, such as text equivalence and operability, keyboard only input, skip navigation and control of forms. (*Declaring conformance on web accessibility*, 2011)

This is a concern as it is difficult, if not impossible, to compare websites based upon their own declarations about their accessibility. In order for an evaluation of a website to be reliable, it needs to follow a recognised method of evaluation such as the *WCAG-EM*. (World Wide Web Consortium, 2014b)

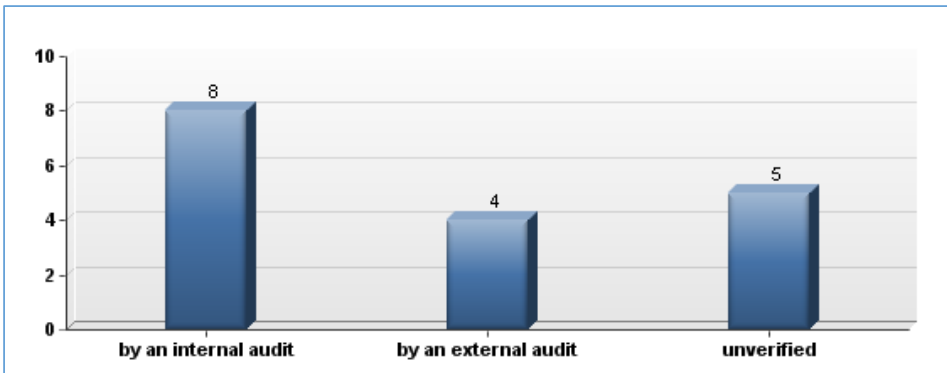


Figure 6-7: Methods for evaluation of websites

Figure 6-7 demonstrates that only four of the survey #3 respondents stated that their website accessibility evaluations were verified by an external audit. Thus it is possible to understand why twelve of the seventeen stated their websites were accessible to either *WCAG 2.0* Level A or AA, making their claims very difficult to substantiate and this research would show that this analysis is not correct.

The other factor is that, due to the ever-changing nature of websites, an evaluation, even if accurate and completed today, may be inaccessible within a very short period of time. In the study completed on behalf of the ANEC, one of the findings was stated as:

It is recommended that the certification bodies should move towards the use of *WCAG 2.0* and to encourage the use of this guidance at national level. In either case, the developers who make use of certification or self-declaration need to ensure that there is a plan for maintenance and retesting to ensure that the websites remain accessible and provide clear statements of accessibility policy that reflect their current plans and actions to achieve a consistent standard of accessibility. Finally W3C should initiate some levels of quality control on the use of the *WCAG* labels to ensure that they continue to have value to people with disabilities. (*Declaring conformance on web accessibility, 2011*)

6.4 NATIONAL TRANSITION STRATEGY

In an effort to understand more about the *NTS*, including how this approach was selected by the Australian Government, the researcher posed a number of questions to Ms Jacqui van Teulingen, Director of the Web Policy Team at AGIMO, part of the federal Department of Finance and Regulation. These questions and their answers are provided verbatim in Appendix 4-25.

The questions posed deal with the background, initial findings, possible shortfalls, other government models, and possible improvements to the *NTS*.

The Web Accessibility National Transition Strategy (Strategy) was developed, primarily for Australian Government websites, to support transition to *WCAG 2.0* and as the primary document to guide the national implementation of *WCAG 2.0* in a unified, consistent and cost-effective manner. (van Teulingen, 2013)

The strategy implemented during the *NTS* followed the approach used by the federal government for other ICT standards within the government. It is a three-phased approach which covers preparation, transition and implementation and incorporates a reporting regime. Also included in the *NTS* are a number of supporting projects led by AGIMO to support and assist agencies as they progress towards *WCAG 2.0* compliance.

One of the questions posed concerned the perceived lack of “enforceability” of the *NTS* and whether that was perceived as a problem. The response stated that enforceability in a government is “best described as a layered, self-assessed, and self-monitored approach” (van Teulingen, 2013). The document also refers to the *DDA* (Australian Government, 2013a), which placed a legislative requirement on organisations that also include public sector agencies. Lastly, Australia has a *National Disability Strategy (NDS)* which introduces measures dealing with discrimination and human rights violations. The *NTS* is included as on-going work under the *NDS* with the reporting component to assist with measurement and reporting of the achievements of the *NDS*. (van Teulingen, 2013). The communication from AGIMO states that breaches of legislative requirements usually attract pecuniary penalties:

AGIMO has no such remit and cannot enforce nor penalise any agency for non-conformance; rather our consistent approach is to work collegiately with agencies, States and Territories through a national *WCAG 2.0* Reference Group and a practitioners’ Community of Expertise to ensure they understand and commit to improving ICT accessibility as an ethical, inclusive and sustainable program of work. (van Teulingen, 2013)

The question was asked about whether AGIMO would be checking the claims of agencies regarding their accessibility. It was answered that AGIMO is not checking conformance statements or claims by agencies, but is considering an independent validation programme on some of the Federal websites after the conclusion of the *NTS* in December 2014.

From AGIMO's perspective, the model is working. In Appendix 4-23, van Teulingen (2013) states there has been "good preparation by agencies and a solid base to commence transition and implementation." However, the *2012 Progress Report* (Australian Government, 2013b), released in December 2013, does not paint as positive a picture. According to this report, 26% of federal government websites met *WCAG 2.0* to Level A by the first deadline of December 2012, excluding social media. This indicated an improvement from the 5% reported in the 2010 *Baseline report*. The *2012 Progress Report* states:

... it has become clear that conformance with the *WCAG 2.0* standard is particularly demanding and that we cannot expect all government websites, information and applications to conform with *WCAG 2.0* at all times. (Australian Government, 2013b)

While it is understandable that agencies find it difficult to comply with *WCAG 2.0* consistently, the *2012 Progress Report* states that only 154 or 11% of the Government websites stated they placed a high priority on achieving *WCAG 2.0*, while 242 or 17.3% placed a low priority on conformance and 797, or 57%, had not prioritised website accessibility at all. Other statistics include the following:

- 302 (26%) of websites were reported to meet *WCAG 2.0* Level A or above;
- 481 (41.4%) websites were report as not assessed;
- 387 (32.6%) of websites were reported as non-conforming;
- 39% of new websites were reported to conform with *WCAG 2.0* at launch;
- 25% did not conform and 35% were launched without a conformance assessment;
- Legacy content and documents were reported to be the issues impacting most on achieving conformance with *WCAG 2.0*;
- For web applications, the largest barriers to conformance were reported as resources and timeframes; and
- 781 (68.2%) of applications had not been assessed. (Australian Government, 2013b)

With the emphasis on website accessibility and mandatory reporting, it is surprising that new websites being launched were done so with their developers knowing they were not conforming. It is also surprising that such a large percentage of the new websites were launched without a conformance assessment and that so many of the applications had not been assessed. The *2012 Progress Report* also stated that none of the agencies had reported assessing their mobile applications against *WCAG 2.0* even though 138, or 12.1%, of the web applications were mobile-enabled.

Contrary to the surveys conducted during this research, the *2012 Progress Report* states there were:

63 staff whose primary role is dedicated to web accessibility with a total of 33 agencies having a dedicated resource. Large agencies lead the way with close to 50% reporting that they have at least one staff member whose primary role is web accessibility." (Australian Government, 2013b)

When agencies were asked to report on risks, the most significant risk to achieving website accessibility was a lack of funding and resources, which would confirm the findings of the surveys for this research.

The *2012 Progress Report* lists a number of priorities for action in its findings. These plans, which relate to the findings of the report, correlate directly with those of this research:

- Complete any remaining audits of the number of websites and web applications, including those provided by a third party;
- Complete conformance assessment of all websites and web applications currently unassessed;
- Assign a *WCAG 2.0* upgrade priority to all websites and web applications, with priority on the minimum online content requirements;
- Deploy accessibility conformance testing tools and, where required, external testing services to complement agency capability;
- Review accessibility action plans addressing upgrade priorities, alternate access methods, maintenance and monitoring practices;
- Update agency web policies to provide for *WCAG 2.0* conformance for all websites and web applications;
- Release progressive accessibility enhancements to their web environments as they are developed; and
- Maintain a program of education and training for agency staff on accessible authoring practices, accessible procurement requirements and conformance testing methods.

Amongst other plans, AGIMO stated in its *2012 Progress Report* that it plans to “share methodologies for *WCAG 2.0* conformance testing ensuring repeatable, comparable, standardised tests for agencies.” This statement directly addresses concerns raised by Brown, Hollier and Conway (2013), stated in Chapter 8, in which the lack of a uniform evaluation process is discussed. AGIMO also plans to conduct a final survey in 2015 at the end of the *NTS* to measure the final progress toward accessibility of the Government websites.

At the commencement of this research, a letter of support was obtained from Ms Jacqui van Teulingen, Director of AGIMO’s Web Policy Team, which is provided as Appendix 4-24. As can be seen from this letter, AGIMO expressed interested in the findings of this research and has been advised that this thesis will be available following submission. The content of Ms. van Teulingen’s letter was provided to participants in the initial email they received, and has been provided as Appendix 4-24.

7 RESEARCH QUESTIONS

7.1 ADDRESSING THE RESEARCH QUESTIONS

This research was designed to assess the outcomes of the federal government's *NTS* as well as to identify other key factors affecting website accessibility in Australia. The research questions have been answered by the data collected by the researcher over the past two years, consisting of manual website evaluations, automated evaluations, user testing and three surveys.

While the previous section discussed the results of the data collection, the following section addresses the research questions, providing answers gleaned from the data collection and analysis.

7.1.1 PRINCIPAL RESEARCH QUESTION:

How effective is the government-mandated web accessibility strategy, The National Transition Strategy, in bringing about compliance with WCAG Version 2.0 for a sample of sites identified as required to meet WCAG standards within a specified time?

In order to address this question, it was necessary to determine if any of the websites actually met the target of compliance with WCAG 2.0 to Level A by December 31, 2012. Table 7-1 shows that only two of the websites actually met the requirement based on the five pages manually evaluated by this date, while a number of others came very close to Level A and four of the websites also came close to meeting Level AA. It should be noted that FD6 was not compliant by December 31, 2012 which was the Level A deadline of the *NTS* for federal government websites, but it was compliant by March 2013. It has been included in this table for illustration purposes only.

Table 7-1: Websites meeting target compliance

Category	ID	Met Level A	Met Level AA	Comment
COR	COR13	almost	no	very close to level A
COR	COR29	close	no	quite close to level A
FD	FD2	close	no	reasonably close to level A
FD	FD4	yes	almost	very close to level AA
FD	FD6	yes	almost	very close to level AA NB: this website was not compliant by the deadline, however it was compliant by March 2013
FD	FD8	almost	no	very close to level A
FD	FD9	close	no	quite close to level A
FD	FD11	close	no	quite close to level A
FD	FD12	almost	almost	very close to both levels
FD	FD16	close	close	quite close to both levels
FD	FD17	yes	no	close to level AA
LG	LG1	almost	close	virtually A compliant- couple of very minor issues, close to level AA
NFP	NFP2	no	no	First manual test passed both levels but second test did not pass either
SG	SG15	almost	almost	
SG	SG39	close	no	

Table 7-1 illustrates that of the fifteen websites who either passed Level A or came close to doing so, nine were federal government, two were corporate, one was a local government, one was a not-for-profit, and one was a state government website. No government-affiliated websites came close enough to meeting Level A to be included in this group. As there were seventeen federal government websites in the target sample, it can be concluded that the *NTS* has had a very favourable effect upon the websites of federal government agencies. This analysis provides the balance to the previous analysis of the overall percentage of change between Evaluation #1 and #2 of the manual testing. In Chapter 4, it was shown how the poor results from a small number of the websites caused a detrimental effect upon the results of the group as a whole.

An important aspect of the *NTS* is the provision of training for agencies as stated in Section 2.1 Training and Education of that document. (Australian Government Information Management Office (AGIMO), 2010b). Of the seventeen respondents who answered the question in survey #3 relating to whether they were experiencing difficulty understanding *WCAG 2.0* Level A requirements, only two responded in the affirmative. As 79% of the respondents to survey #3 were government departments and would have received more information because of the *NTS* it is assumed that this strategy was largely successful in providing information regarding both *WCAG 2.0* and departmental responsibilities.

In their analysis of the first stage of implementation of the *NTS*, Brown et al. point to the fact that only three of the federal government websites clearly passed *WCAG 2.0* compliance on the pages tested, while two others passed with a borderline qualifier having only a couple of minor violations. One website failed with issues that would impact upon usability, but would conform with *WCAG* Level A without too much difficulty (J. Brown et al., 2013). Brown et al. state that the *NTS* has had a positive impact in progressing awareness in Australia of website accessibility. This research demonstrates that, while the *NTS* has not brought about total compliance, even within the federal government websites, it does appear to have created a “culture of awareness” in terms of government web activity. This is particularly evident when the accessibility of the government websites is compared with the non-government websites.

7.2 SUPPORTING QUESTIONS

While the principal research question examines the outcomes of the *NTS*, there are other factors connected with website accessibility in Australia and internationally which should be examined: what part, if any the type of organisation plays in its accessibility, the essential components in a website evaluation methodology, the critical success factors observed in accessible websites, and lastly the difficulties faced by organisations in creating accessible websites.

7.2.1 SUPPORTING QUESTION ONE:

Does the type of organisation play a role in the demonstrated levels of compliance, the time it takes to reach that level and the obstacles faced in achieving this level of compliance?

Table 7-1 shows that only three of the websites who met, or nearly met, the goal of *WCAG 2.0* Level A were from non-government websites, showing that the type of organisation did play a significant role in the accessibility of the websites.

Table 7-1 also demonstrates that the federal government websites fared considerably better than the other categories by all testing methods, only slipping to third in the last automated testing result. Both the state government and local government categories came next, followed by not-for-profit, then government-affiliated and lastly corporate.

In order to compare the rankings from the different testing methods, mean scores were extracted from tables 4-9, table 4-32 and the user testing scores from appendix 4-21. It should be noted that the user testing scores were calculated differently from the manual and automated scores, in that the better the website ranked the higher the score out of twenty-five possible points. Consequently a higher mean is a better result for the user testing category only. For the other scores, the lower the mean the better the result.

Table 7-2: Comparison Table of Rankings

Category	Manual 1 Rank	Manual 2 Rank	User Test Rank	Automated 2 Rank	Automated 7 Rank	Total Rank Score
Federal Gov.	1	1	1	1	3	7
Mean Score	22.93	23.61	16.53	84.1	153.9	
State Gov.	4	4	4	6	2	20

Mean Score	27.79	27.44	14.48	231.3	158.8	
Local Gov.	2	3	2	4	6	17
Mean Score	24.4	24.93	15	178.6	193.7	
Gov. Affiliated	2	2	3	5	5	17
Mean Score	24.4	23.94	14.7	203.4	189.8	
Not-for-profit	5	5	6	2	1	19
Mean Score	41.73	47.49	11.89	154.1	143.9	
Corporate	6	6	5	3	4	24
Mean Score	56.88	64.35	13.24	158.5	151.4	

However, discounting the automated testing results, the order would show federal government, local government, government-affiliates, state government, not-for-profit and then corporate as shown in Table 7-3. Viewing the rankings in this way enables us to see the close similarity of ranking results between manual expert testing and user testing. It is the addition of the automated results which change the results in Table 7-2 as the automated testing places the not-for-profit group ahead of the others. This is at odds with the manual and user testing results.

Table 7-3: Ranking without automated testing

Category	Manual 1 Rank	Manual 2 Rank	User Test Rank	Total Rank Score
Federal Gov.	1	1	1	3
State Gov.	4	4	4	12
Local Gov.	2	3	2	7
Gov. Affiliated	2	2	3	7
Not-for-profit	5	5	6	16
Corporate	6	6	5	17

In answer to supporting question one, from the results above it is evident that the government organisations performed better overall except when the automated results are included. Even when the automated results are included, there is only one point between the state government and the not-for-profit categories. When looking at the results without the automated results, it can be observed that the government websites fared considerably better than the non-government websites, again drawing into question the reliance on automated testing.

As discussed in the survey results in Chapter 5, more government than non-government website owners responded to the surveys, possibly indicating a greater interest in website accessibility. This could be hypothesised to be due to the influence of the *NTS* from the answers to the related survey questions summarised in Chapter 6.1.4 above.

The federal government websites were the most accessible at both the beginning and ending of the data collection period. However, because of the poor performance of a number of the websites in the category, the overall category results showed a slight deterioration from evaluation #1 to evaluation #2. While the organisations within the federal government category might be disappointed that their category did not show an increase in accessibility overall, the data in Table 5-23 shows that the most accessible websites and those which met *WCAG 2.0* Level A were predominately federal government websites.

These results echo those of the study of Hackett et al. (2005), mentioned in Chapter 2, which compared U.S. government websites to non-government websites over a five year period from 1997 to 2002. Although quite dated, the results showed that both groups of websites increased in complexity over time as they incorporated increasingly rich content. The non-government websites became increasingly less accessible while the government websites remained relatively accessible. Hackett et al. attribute this phenomenon to the enforceability of *Section 508 of the Rehabilitation Act* (United States Government, 2014).

7.2.2 SUPPORTING QUESTION TWO:

What are the key elements of a website assessment evaluation methodology?

As has been discussed at length in this thesis, a robust evaluation methodology should include manual evaluation by an experienced and knowledgeable evaluator or, more preferably, by an evaluation team, and further supported or enhanced by the addition of user testing by people with disabilities, including senior citizens. The addition of automated testing can support manual evaluations due to its ability to crawl whole websites. In some cases, automated testing may provide graphic illustrations of problems to allow them to be more easily located for remedial action. It may also be able to locate clusters of errors or pages with multiple problems. Therefore, these strategies would be considered as the key elements of a methodology which could also include aspects gleaned from survey responses from owners of the most accessible websites.

As stated previously, the *NTS* provides for the training of agencies in understanding both *WCAG 2.0* and the responsibility of the agency for implementation of accessibility principles and monitoring of the on-going compliance of the website. Websites which performed best in the accessibility evaluations had a corresponding commitment to training and education of their staff as demonstrated in the surveys. One respondent stated; “This means regular compliance checks and continuing education of website content authors or publishers.” Compliance therefore requires the following:

- Training and education of staff to enable regular in-house or preliminary testing;
- External auditing for validation of results and reporting;
- Periodic re-testing, using a process to determine if the website has changed sufficiently to warrant a re-test;
- Training of document creators to ensure that documents are created with consistent accessibility;
- Sound policies regarding documents including PDFs and their accessible alternatives; and
- Personal accountability and ownership by staff who add material to the website, so that new material meets required guidelines, with staff being tasked specifically with the monitoring of the accessibility of the website

These methods have been developed by comparing the results of the testing by all methods. The surveys conducted provided considerable anecdotal information to augment the testing results. It was also possible to compare the survey responses of those websites which scored highest to those which scored lowest in the different testing methods.

While the results clearly show the similarity of results for manual expert evaluation and user testing, the combination of two methods substantiates the methodology as well as providing the additional usability information that comes naturally from user testing.

Automated testing is a welcome addition to a robust accessibility testing methodology because of its ability to perform extensive website crawls through very large websites, which would not be feasible for organisations which often have websites with over 50,000 web pages. Manual expert valuation generally necessitates testing a sample of web pages to save time and cost. While *AGIMO* recommends that 10% of the pages of a website be tested, this is often not possible because of budget restraints. However, as the *WCAG-EM* states, a carefully chosen sample of pages should provide a robust evaluation and be indicative of the overall accessibility of the website.(World Wide Web Consortium, 2014b)

Figure 6-5 outlined the different time requirements for automated, manual and user testing. The discussion of the various testing methods clarified that the choice of pages, sample size and evaluation methods are often restricted by budget constraints. In the review of the survey responses, budget and time are consistently regarded as barriers to achieving website accessibility compliance. The researcher was able to run up to five instances of automated evaluations at the one time on 2000 pages each, taking several hours. However, these

evaluations could run in the background, allowing the evaluator to complete other work. This contrasts markedly with the manual evaluation of a single page, which would require the evaluator's complete attention and which would usually take an experienced evaluator from one to two hours, depending upon the complexity of its content and the experience of the evaluator.

Having a reliable method for evaluating the website will result in being able to make an accurate statement about the accessibility of that website. This concept was introduced in Chapter 6, Methods for Self-Evaluation. This also refers back to the principal research question of whether the *NTS* and mandated strategies are able to bring about more accessible websites. If everyone is assessing their websites according to different methods and having different bases for the compliance statements of their websites, it is not possible to use these results to determine the whether such a strategy is successful.

WCAG 2.0 provides a normative set of testing procedures. However, trying to ascertain the actual outcomes of the *NTS* from self-reported results is probably not possible without a consistently-applied evaluation methodology. One of the purposes of the methodology proposed by the *WCAG Evaluation Methodology* is to provide a reliable and repeatable testing methodology which, if followed correctly, should make it more possible for repeat evaluations to reach the same conclusions. "Following this methodology will help evaluators apply good practice, avoid commonly made mistakes, and achieve more comparable results (World Wide Web Consortium, 2014b).

While Brown, Hollier and Conway believe that the *NTS* has had a positive impact in progressing accessibility awareness, they highlight the lack of a consistent auditing methodology: "The issue of auditing methods and tools is also a critical one, in that the *NTS* does not specify any particular method or tool beyond stating that 'AGIMO will investigate whole-of-government automated conformance testing tools.' " They argue that the lack of consistent methods and toolsets is one of the reasons for the "poor results of the first stage of the *NTS* implementation" (2013).

7.2.3 SUPPORTING QUESTION THREE:

What are the critical success factors for organisations that achieve compliance to *WCAG 2.0* A or AA?

The survey responses from organisations which achieved the best results indicate that there are a number of factors influencing the accessibility of their websites. Organisations that are serious about the accessibility of their website have trained and experienced staff to ensure that any new websites are created with accessibility in mind from the beginning of the project. A sense of frustration was voiced in the surveys by organisations with large legacies of inaccessible material that would need to be archived or remediated. Often these included PDF documents which contained material that cannot be deleted and are very expensive to convert into accessible alternative documents, particularly if the original document is not still in the

organisation's possession. The time and cost of creating a website with accessibility in mind is generally much less than creating a website and then having it tested, only to have extensive remediation required in terms of both design and content.

As a means of preparation for an external website accessibility audit, an organisation should have the capacity to conduct preliminary website evaluation. This is akin to preparing for a financial audit where all material is collected and checked to ensure that the following audit proceeds smoothly with the least possible time and cost. In the same manner, W3C and other organisations have extensive suites of material to assist individuals within an organisation to perform preliminary investigations and remediation as part of their audit preparation. These activities might include making sure all images have suitable alternative text, making sure all videos have captions and transcripts, colour contrast meets required guidelines and code is validated. The most successful organisations know when their website has been evaluated, to what level and using what methods. External verification of the accessibility of the website is seen as a means of providing proof of the accessibility level of the website and also as a measure of litigation risk mitigation. When a preliminary internal evaluation has been completed and the necessary corrections made, then the organisation is in a strong position to proceed to external verification.

Websites that were most accessible answered questions positively in the survey regarding the level of corporate support for the accessibility function. However, that is not to say they do not experience some frustration at the lack of resources available due to budget constraints. There was considerable frustration voiced by respondents from organisations who did not feel that the accessibility function was sufficiently resourced and believed they could do much more if resources were increased.

It is obvious that an organisation will not be successful in meeting guidelines, for example, *WCAG 2.0*, if they do not have sufficient understanding of these guidelines. While the *WCAG 2.0* document is long and sometimes quite difficult for the novice to understand, W3C has produced a number of informative documents designed to assist organisations in their understanding. The W3C WAI has a working group dedicated solely to this task, known as the Education and Outreach Working Group. This group maintains and updates the informative documents and provides resources, such as presentations, showing the business benefits of accessible websites, introduction to website accessibility and many others. It has also produced a document, *Easy Checks* (W3C, 2013b), which was in public working draft stage in mid-2014. This document is designed specifically to assist the novice and is particularly helpful for preliminary website accessibility analysis.

There was an improvement in the survey responses regarding tools that may assist in accessibility evaluations. The knowledge of available tools is important. As organisations begin to understand their obligations to make their websites accessible, they invariably start to look for tools that may provide assistance. This improvement in the level of knowledge of available tools demonstrates this trend. However, it seems from the survey responses that a number of organisations are still strongly reliant upon automated tools for their assessments.

This demonstrates either a lack of knowledge of the coverage, completeness and correctness of automated tools, or a budget that will not permit manual or user testing.

It is critical that there are knowledgeable staff who are assigned specific responsibility for the accessibility of the website, including content control. The survey responses demonstrated that in many of the organisations there is no specific staff member assigned overall accountability for the accessibility function. In other countries, a specific role is associated with this function. Anecdotally the survey responses stated that it is considered everyone's responsibility and the reality of this practice is that consequently no one takes personal ownership or responsibility. Organisations who specifically assign a job role with responsibility for accessibility are more likely to ensure that the accessibility of the website is maintained. Some organisations have built in safeguards in their content management systems for procedures that will help to ensure that inaccessible content is not uploaded to the websites. These safeguards involve completing a series of checks prior to the new content being approved by the appropriate responsible manager. The content is tagged as being created by a certain person and cross-checked to ensure it is accessible with all relevant signatures required before the content management system will allow the material to be posted.

Finally, it is strongly recommended by the W3C, the Australian Government and the Australian Human Rights Commission that testing is conducted by users with disabilities and senior citizens. (W3C, 2010a) (AGIMO, 2004)

There are a number of evaluation tools and techniques that web designers can employ to test the accessibility of their sites. However, there is no complete substitute for user testing, and designers should, wherever possible, involve users of assistive technology in the testing and evaluation of the accessibility of their websites and web content. (Australian Human Rights Commission, 2010)

Some of these factors should not be considered optional, such as knowledge of the guidelines and knowledge of the tools and resources that are available to assist the organisation in achieving accessibility. In Australia, it would seem that very few organisations go to the extent of involving users with disabilities and senior citizens in their website evaluations. As mentioned previously, this is often expensive, time-consuming and can be difficult to coordinate. However its importance should not be overlooked, and possible avenues sourced. It is also advisable to recruit users with a variety of disabilities but who are also experienced users of the Internet and assistive technologies.

In some cases, following an evaluation of a website, it is more prudent to plan a new website incorporating the lessons learned from the evaluation. This may be due to factors such as cost as remediation is sometimes more expensive than re-building, technology if the current CMS or website does not facilitate accessibility, and designing with accessibility in mind. Loiacono and Djambasi (2013) state that the cost of fixing a problem after release is ten times more than when it is fixed during development, and 100 times more than when the same

problem is fixed during design, factors which may assist organisations deciding whether to attempt remediation or to design a new website.

The websites that provided the best experience for users with disabilities were also those that scored best in the manual testing. This would indicate that adherence to *WCAG 2.0* does generally follow with a better user experience for people with disabilities.

The results of a study by Loiacono and Djambasi (2013) which assessed the factors likely to affect a company's decision to incorporate website accessibility, indicate that the key factors which influenced the company's level of website accessibility were the number of IT professionals the firm employed, the level of the accessibility testing the company performed and whether the company's website came under any legislative mandate to comply with specific website accessibility guidelines.

7.2.4 SUPPORTING QUESTION FOUR

What are the obstacles faced by organisations in achieving mandated website accessibility compliance?

From the three surveys, the research discovered a number of obstacles cited by organisations as affecting their websites' accessibility. These obstacles are shown in Figure 7-1.

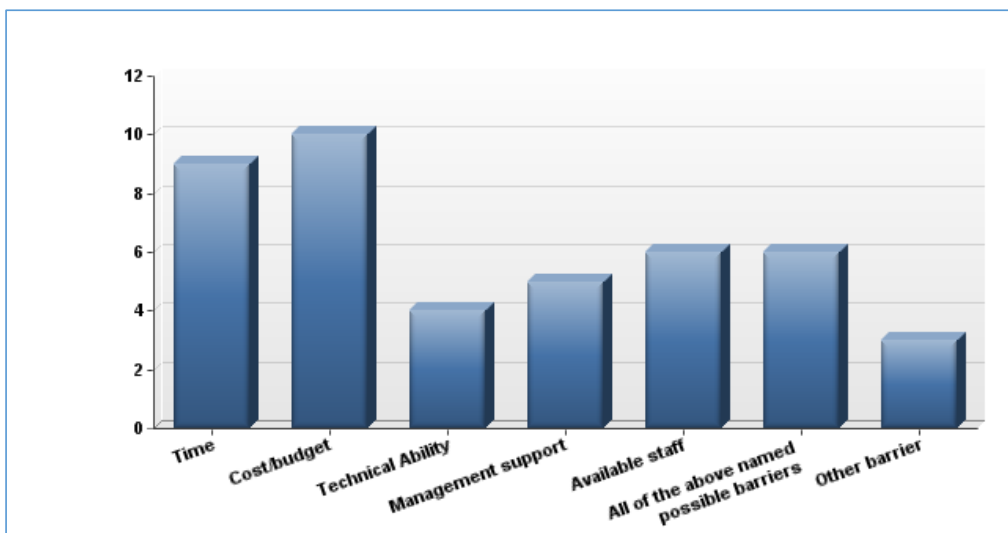


Figure 7-1: Survey 3 - Obstacles to achieving accessibility compliance

Organisations repeatedly mentioned the lack of resources, which included staff availability, skills and understanding, technical capability and available budgets to fund the testing and remediation work required.

With the tightening of budgets for departments during the research period, respondents reported they are now required to fund accessibility testing of their websites from existing staffing resources. This poses problems for many organisations which do not have adequately trained staff to fill these roles. Consequently the issue is often not receiving the attention it requires due to the lack of trained staff with sufficient resources to spend upon testing and remediating the website. Respondents indicated that the allocation of funding for the testing role, usually not filled by one person, is an issue that is not being adequately addressed. According to respondents, issues compete for priority, especially with the push to move services online as quickly as possible. Respondents also indicated that education and training of staff responsible for implementation and remediation of accessibility features is not being adequately resourced. On-going training is required for staff who are content editors in organisations. Often many staff members have this role due to their creation of documents which eventually find their way onto the organisation's website.

Some organisations report problems with not knowing what to do with legacy content which does not meet accessibility requirements. Organisations are concerned with how long they should keep documents prior to archiving and format in which to archive. They are also unsure about the formats in which to provide alternatives. This is often the case with PDF documents which most Australian government and business entities are required to publish each year in the public domain. The time and cost of making the documents accessible is considered too high to justify the expenditure of resources. One respondent identified this problem as an issue of legacy systems producing non-compliant content, additionally declaring that, due to a culture of paper-based record keeping, there are scanned documents kept for FOI information which are largely inaccessible.

The issue of executive management support for the role of accessibility was raised by a number of organisations. For some organisations, addressing the accessibility function is more of a grass-roots or "bottom-up" approach by staff, who see website accessibility as critical, campaigning for allocation of resources which are not always views as necessary by senior management. As with any identified risk, senior management support is critical if the issue is to get the attention it deserves.

One survey respondent answered the question about the identification of critical issues relating to website accessibility, for organisation COR29, as follows: "Care factor. We have worked very hard to educate about the benefits and the obligations of providing accessible content, but the general feeling is that non-accessibility is a risk most business areas are prepared to wear, which is disappointing."

This study has mentioned technical issues, such as how to handle PDF documents, who is responsible for the accessibility of external content, which mark-up language version is most appropriate for the organisation, when to up-grade the website, the role played by content management systems, many times. Many organisations reported frustrations with the limitations posed by the content management systems which would not allow them to implement the accessibility features they wanted. Other organisations were

frustrated by lack of accessible resources for their needs, including accessible multimedia players, or having to use non-compliant external databases. In many cases, these are not within the remit of the organisations and their websites receive complaints because of their lack of accessibility.

Different users require different solutions. In creating a customisation for one user's needs e.g. someone with dyslexia, it may create a problem for a different user, e.g. someone who is colour blind. This was identified by survey respondents as a difficulty they face, requiring additional education and skills in meeting as diverse set of needs as possible. The *WCAG 2.0* documentation refers to the fact that, even if a website met all of the success criteria, it may still pose additional accessibility and usability issues for some users. Websites are increasingly relying on the user to use their own browsers to customise their experiences. Some websites try to overcome the knowledge divide between users by providing links to resources describing methods for customising the display of content, such as that provided by the BBC's *My Web My Way*. (British Broadcasting Corporation, 2013)

8 CONCLUSION

8.1 INTRODUCTION TO THE CONCLUSION

This research examined 138 Australian websites, including federal, state or territory and local government, government-affiliated, not-for-profit and corporate websites, in order to determine the outcome of the Australian Government's Website Accessibility *National Transition Strategy (NTS)*.

The study clearly shows that the federal government websites started as the most accessible and remained in this position. Whether this translates into the *NTS* being successful is not as obvious. However, it is apparent, from all results, that the federal, state and territory, local and government-affiliated websites were more accessible and showed far greater improvement over the data collection period than the not-for-profit and corporate categories.

This research considered the number of websites that improved, compared to those that showed worsening numbers of accessibility violations, and found that 38.27% of the government websites improved versus 22.81% of the non-government websites. Accordingly, it is possible to state that the main outcome of the *NTS* is the overall improvement in accessibility of government websites. However, it is important to note that only two of the 138 websites in the sample met the first target of *WCAG 2.0* Level A by December 31, 2012. This date was the Level A compliance deadline for the *NTS* and occurred after the completion of this research's data collection phase. The low number of successful transitions should be a concern for the Australian Government due to the amount of effort that has been put into the running of the *NTS*.

There are a number of factors that were identified in the analysis of the results of the evaluations and the survey results. One of those is that the resourcing of the responsibility for website accessibility varies greatly between organisations, with few organisations actually having a staff position responsible for accessibility. Organisations which demonstrated greater accessibility and/or improvement stated clearly that there was an emphasis in their organisation to address the issue and that there is often a specific person or team responsible for this function.

Another factor which was highlighted by the research was the lack of a unified methodology for testing the websites for accessibility. It is hoped that, with the publication of the *WCAG Evaluation Methodology*, this lack may be rectified in the near future, particularly if its approach is endorsed by the Australian Government and communicated to both government and non-government website owners.

In other countries, there are penalties for non-compliance of websites, but this has not been a part of the *NTS* for reasons stated by AGIMO. They state that the Australian Government sees enforcement as a "layered, self-assessed, and self-monitored approach" and recognises that all agencies are required to abide by government

directives (van Teulingen, 2013). This is more fully described in Appendix 4-16 in the discussion document prepared for the researcher.

The results for the corporate category are cause for great concern as these websites became obviously less accessible over the data collection period. This indicates that the message about requirements to meet accessibility guidelines has not adequately reached this sector. The fact that web developers are not mandated to be members of any accrediting body or meet any educational or work-related standards speaks to the issue of accessibility knowledge and understanding. While there have been some notable court cases internationally regarding website accessibility since the landmark Sydney Olympics case in 2000, this has not been as widely publicised as similar cases in other countries. It is apparent that many complaints do not reach the courts and no information becomes publicly available about the outcomes and settlements. If Australia follows the lead of other countries, litigation will become more common and may result in more corporate organisations getting the message and applying accessibility standards to their websites. We can conclude that the *NTS* did not have a flow-on effect to non-government organisations and that some other method will need to be found to bring these websites into compliance with *WCAG 2.0* to Level AA as recommended by the Australian Human Rights Commission.

Organisations within the federal government category were among the best performing of all of the websites and this may be attributed to greater dissemination of information by the government via AGIMO and the *NTS*. There were some notable exceptions in other categories, including one of the local government websites in which it is obvious that the organisation has pursued greater education and training in the requirements and responsibilities of website owners.

One of the main success factors of the *NTS* was the raising of awareness of the issues and requirements of website accessibility, particularly for government agencies. Conversely, the gap between the accessibility of government and non-government websites has widened, which is demonstrated clearly by the results of this research.

The research considered a number of supporting questions, including whether the type of organisation plays a role in the accessibility of a website, the key elements of a website accessibility evaluation methodology, critical success factors for organisations which meet accessibility requirements, and obstacles faced by organisations in meeting website accessibility requirements.

It was found that government agencies were more likely to meet accessibility requirements and that the closer the agency is to the federal government departments related to the development of the requirements the greater their accessibility. Organisations not directly related to government were found to have the most inaccessible websites. Therefore it may be stated that the type of organisation did make a difference to the accessibility of the website.

The key elements of a website accessibility evaluation involve manual evaluation by an evaluator who is knowledgeable about accessibility and the needs of people with disabilities and their assistive technologies. It is also best served by being coupled by testing by people with disabilities and senior citizens. Both of these factors are well documented in the literature available from the Australian Human Rights Commission, the Australian Government and the W3C. While automated testing plays a valuable part in the assessment of websites, the results must not be relied upon as the sole source of evaluation. As well as being documented extensively in literature, this was proven by the comparison of the manual, user and automated testing results of this study. The release of the *WCAG-Evaluation Methodology*, which is in the public working draft stage, will be of benefit to organisations as it provides valuable information on how best to carry out website evaluations in order to produce robust and reliable results.

A number of critical success factors were identified and were demonstrated by organisations whose websites were the most accessible. Organisations which are serious about the accessibility of their websites have trained and experienced staff to ensure that any new websites are created with accessibility in mind from the beginning of the project. As a means of preparation for an external website accessibility audit, an organisation should have the capacity to conduct a preliminary website evaluation. Organisations with the most accessible websites indicated they had the required level of corporate support for the accessibility function. Additionally, the most accessible websites were run by organisations which had sound knowledge of *WCAG 2.0*, adequate tools and resources and understanding of the technical requirements to make necessary corrections.

Lastly, this research examined the obstacles faced by organisations in making their websites accessible. These include lack of time and resources, including staff availability, skill and understanding, technical capabilities and a budget available to fund both the testing and remediation work required.

8.2 LIMITATIONS OF THIS RESEARCH

As *WCAG 2.0* is technologically-neutral, this research has also taken this stance, not exploring whether the use of different technologies, such as JavaScript, impact significantly upon the overall accessibility of the websites. This aspect was mentioned briefly in Chapter 6 Trends, Impact of Technology. More research would be beneficial to determine what effect the use of different technologies have upon the overall accessibility of websites. However, it is reasonable to assume that a simple, static information website would not share all of the difficulties complying with *WCAG 2.0* that would be experienced by a website using dynamically-changing content which depended upon the actions of the user, or by one which provides rich multimedia content.

The automated tool, *SortSite* was configured to test 2000 pages of each of the 138 websites for seven iterations of testing. If time had permitted, it would have been worthwhile to test entire websites and then compare the results to those of the 2000 pages tested. Such testing was not within the scope of this research because of time constraints.

It was also necessary, because of time constraints, to limit the manual expert evaluation to five pages from each of the sample of websites. As it takes from one to two hours per page to assess websites, it was not possible to make the sample larger. This was overcome, at least in part, by choosing as far as possible pages with the same functionality from each website. It is believed that by examining the same type of pages from each website the playing field was levelled.

The *NTS* is aimed primarily at federal government websites and, while it affects the states and territories and flows on to the local government websites, these agencies have a choice whether to meet *WCAG 2.0* Level A or not. Not all of the agencies have chosen to proceed to Level AA. In addition, some of the states have changed the timelines. For example, it was decided that Western Australian state government websites should meet *WCAG 2.0* Level A by December 31, 2013 rather than 2012. A number of the state governments have made *WCAG 2.0* Level A mandatory, with Level AA recommended but not required. This does not comply with the Australian Human Rights Commission's recommendations:

All Australian government websites should comply with the timelines and conformance requirements of the *NTS*, whether or not they are specifically mandated to do so. In particular, state and territory governments are strongly encouraged to comply with the AA conformance level that applies to Commonwealth Government websites (Australian Human Rights Commission, 2010).

The final limitation observed was the time frame of the *NTS* as the data collection period needed to end after the first deadline, which was for *WCAG* Level A by December 31, 2012. As the final deadline for *WCAG 2.0* Level AA does not occur until December 31, 2014, it was not within the scope of this research to determine which of the websites met this final deadline.

8.3 FUTURE WORK

As stated in Limitations above, it was not within the scope of this research to analyse the part played by different technologies upon the accessibility of websites. This should be the subject of further research and might determine whether specific technologies make it difficult, or in some cases impossible, to meet current requirements. Such research may assist developers of these technologies to work on refinements to assist website developers to meet their accessibility compliance requirements.

Under Impact of Technology in Chapter 6, Trends, the researcher touched on the role of the mark-up language upon the accessibility of the website and whether changing mark-up languages correlate with the accessibility of the website. Future research is planned to consider how storing the validation results of a web page and using that as an indicator of whether an accessibility evaluation of the page is required. This may be helpful, as it takes a minimum amount of time to run the W3C validator on a web page and it can now filter out non-

accessibility issues from the results. An overall study of the contrast between pages that validate and accessible pages could also provide interesting results.

Future research could examine the apparent backward trend towards the use of HTML 4.0 shown in the data collected. An analysis of which websites use WAI-ARIA and whether there is a correlation with the list of websites with the best accessibility evaluation results could prove useful in determining whether the use of WAI-ARIA can be shown to improve the accessibility of a website.

In this current research, three surveys were conducted in order to understand participants' knowledge of accessibility, understanding of tools, organisational commitment toward accessibility improvement and other factors. Potentially this analysis could be expanded into a more in-depth content analysis of the responses including an exploration of the organisational structure and management of accessibility in relation to both website evaluation and the user experience design. Future research could explore the idea of building a framework for improving website accessibility compliance within an organisation and analyse correlations between organisation size and type and the demonstrated accessibility of the target websites.

Further research into specific success criteria failure may help toward an understanding of whether failing one particular success criterion correlates with either overall evaluation score, failure of other success criteria and also the results of testing by users with disabilities. In particular, SC4.1.2 which relates to name/role/value, is a success criterion which many websites violate. Research could explore whether the prevalence of dynamic controls has any correlation with violation of this success criterion and how that might influence the difficulties experienced by users with disabilities.

8.4 CONCLUDING REMARKS

In this research, the importance of website accessibility has been thoroughly examined along with the various methods for determining the accessibility of the website and the compliance with the established Australian and international guidelines, namely *WCAG 2.0*. The WAI reminds us that:

Millions of people have disabilities that affect their use of the Web. Currently most Web sites and Web software have accessibility barriers that make it difficult or impossible for many people with disabilities to use the Web. As more accessible Web sites and software become available, people with disabilities are able to use and contribute to the Web more effectively. (W3C, 2005)

This is reinforced by the Australian Government's *Web Guide* which states:

Ensuring that information and services meet the needs of a diverse audience in multicultural Australia will help improve public access to government and improve the value of agency investment in their websites and online service delivery. (Australian Government, 2013c)

Finally, the Australian Human Rights Commission provides this advice with regard to planning for the future:

Almost 4 million Australians have a disability. About 50% of people aged over 55 have difficulty with their mobility, hearing or vision. By 2050 more than 25% of the population will be over 65. If we add their families, friends and colleagues the number of people affected by disability is larger still.

Each of these people is a potential customer, client and employee.

So good access to the buildings from which you operate and the services you provide makes good business sense. (Australian Human Rights Commission, 2013)

The results of this research demonstrate clearly that the federal government websites began as, and remained, the most accessible of the categories of Australian websites examined. This result can be attributed to the greater communication, training and emphasis placed upon website accessibility in this sector, including the existence of such a strategy as the *NTS*. The *NTS* provides a demonstration of how a policy instrument, even one lacking enforceability or testability, may produce positive outcomes for those it seeks to benefit.

This research has been conducted in the Australian context, however due to the international moves towards adoption of accessibility, the message and findings from within this thesis are highly applicable to other nations and their development of policy instruments to manage the implementation of website accessibility.

Boldyreff stated: "Universal accessibility remains a dream; and may not be achievable within the limitations of our current collaboration technology employed over the web." (Boldyreff, 2002) While society certainly has not yet reached that state of "universal accessibility," governments and social groups around the world continue to work toward that dream.

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9.1 REFERENCES - LEGISLATION

9.1.1 AUSTRALIA

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Commonwealth Authorities and Companies Act 1997 (Cth.)

Disability Discrimination Act 1992 (Cth.)

Financial Management and Accountability Act 1997 (Cth.)

9.1.2 UNITED KINGDOM

Disability Discrimination Act 1995

9.1.3 UNITED STATES

Americans with Disabilities Act (1990)

ADA Amendments Act of 2008 (U.S.C.)

United States Rehabilitation Act 1973 (U.S.C.) Section 508

21st Century Video and Communication Accessibility Act 2010 (U.S.C.)

APPENDICES

Appendix 4-1 Manual Testing Results – Federal Government

ID	Perceivable 1	Perceivable 2	Operable 1	Operable 2	Understandable 1	Understandable 2	Robust 1	Robust 2	Unsupported Tech. 1	Unsupported Tech. 2	Critical Violations 1	Critical Violations 2	Total Violations 1	Total Violations 2	Average per page with penalties 1	Rank 1	Average per page with penalties 2	Rank 2	Average per page without penalties 1	Manual Rank 1 no penalties	Average per page without penalties 2	Manual Rank 2 no penalties	Manual eval percent of change
FD1	55	50	138	198	2	2	5	5	0	0	110	110	310	365	62	25	73	25	40	25.00	51	15	0.1774194
FD2	42	45	8	10	1	1	6	9	0	0	0	0	57	65	11.4	16	13	17	11.4	18.00	13	8	0.14
FD3	17	18	19	23	7	7	9	10	0	0	5	5	57	63	11.4	16	12.6	16	10.4	16.00	11.6	7	0.11
FD4	10	3	9	2	0	0	0	4	0	0	0	0	19	9	3.8	4	1.8	2	3.8	4.00	1.8	1	-0.53
FD5	48	24	29	14	1	0	4	10	0	0	30	40	112	88	22.4	21	17.6	18	16.4	21.00	9.6	6	-0.21
FD6	34	30	43	62	0	0	5	10	0	0	0	0	82	102	16.4	18	20.4	22	16.4	21.00	20.4	12	0.24
FD7	35	40	21	27	15	15	8	11	0	0	5	5	84	98	16.8	19	19.6	21	15.8	20.00	18.6	11	0.17
FD8	30	34	29	31	7	8	7	5	15	15	5	0	93	93	18.6	20	18.6	20	14.6	19.00	15.6	10	0.00
FD9	19	24	11	9	0	0	6	8	0	0	5	5	41	46	8.2	11	9.2	13	7.2	10.00	8.2	5	0.12
FD10	128	168	46	50	5	5	9	17	0	0	0	0	188	240	37.6	24	48	24	37.6	24.00	48	14	0.28
FD11	25	17	12	12	2	2	3	5	0	0	0	0	42	36	8.4	12	7.2	10	8.4	13.00	7.2	3	-0.14
FD12	9	6	24	3	0	0	6	6	0	0	0	0	39	15	7.8	10	3	4	7.8	11.00	3	2	-0.62
FD13	53	83	24	22	0	0	30	31	0	0	20	15	127	151	25.4	22	30.2	23	21.4	23.00	27.2	13	0.19
FD14	101	143	145	148	10	10	10	13	0	0	85	55	351	369	70.2	26	73.8	26	53.2	26.00	62.8	16	0.05
FD15	29	37	10	20	0	0	14	9	130	0	0	25	183	91	36.6	23	18.2	19	10.6	17.00	13.2	9	-0.50
FD16	10	16	5	16	1	1	8	5	25	0	0	20	49	58	9.8	14	11.6	15	4.8	6.00	7.6	4	0.18

Appendix 4-2 Descriptive Statistics for Manual Evaluation

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Perceivable 1	137	.0	357.0	77.139	65.4906
Perceivable 2	137	3.0	1723.0	92.555	153.0818
Operable 1	137	.0	243.0	41.934	37.9497
Operable 2	137	.0	198.0	43.774	35.9260
Understandable 1	137	.0	20.0	3.139	3.3611
Understandable 2	137	.0	21.0	3.241	3.7934
Robust 1	137	.0	107.0	14.679	14.4568
Robust 2	137	4.0	101.0	14.876	13.4249
Unsupported Tech 1	137	.0	3835.0	40.292	327.7075
Unsupported Tech 2	137	.0	3250.0	35.723	277.8759
Critical 1	137	.0	115.0	12.730	19.3924
Critical 2	137	.0	212.0	14.664	26.9747
Total Violations 1	138	.0	4010.0	188.536	344.5746
Total Violations 2	138	.0	3462.0	203.348	331.0939
Average per page 1	138	.0	802.0	37.707	68.9149
Manual rank 1	137	2.0	138.0	69.737	39.7910
Average per page 2	138	.0	692.4	40.670	66.2188
Manual rank 2	137	2.0	138.0	69.781	39.7493
Average without penalties 1	137	1.0	99.2	27.378	19.0103
Manual rank without penalties 1	137	1.0	137.0	68.693	39.8079
Average without penalties 2	137	1.8	367.4	30.889	34.1982
Manual rank without penalties 2	137	1.0	137.0	68.679	39.7383
Manual percentage of change eval 1-2	137	-86.03%	821.00%	18.9134%	96.54920%
Valid N (listwise)	137				

Appendix 4-3 Manual Evaluation – Ranking for all websites

	Rank-Eval 1 with penalties	Rank - Eval 2 with penalties	Rank - Eval 1 no penalties	Rank -Eval 2 no penalties
COR1	132	133	131	133
COR2	84	89	91	100
COR3	61	69	75	78
COR4	100	123	28	39
COR5	101	137	114	137
COR6	94	100	96	108
COR7	107	111	109	118
COR8	117	117	109	121
COR9	119	112	128	124
COR10	111	98	99	98
COR11	33	23	41	24
COR12	67	68	66	72
COR13	5	6	5	5
COR14	56	49	70	60
COR15	112	106	111	106
COR16	39	51	51	62
COR17	85	78	79	78
COR18	90	88	101	94
COR19	59	89	60	97
COR20	79	110	79	110
COR21	68	120	23	11
COR22	87	97	74	78
COR23	125	121	125	126
COR24	16	11	12	14
COR25	36	47	46	66
COR26	77	80	68	55
COR27	138	138	102	111
COR28	129	131	117	107
COR29	46	40	6	6
COR30	19	26	20	37
COR31	95	104	98	114
COR32	115	115	121	123
COR33	51	42	60	51
COR34	72	82	82	87

COR35	80	56	89	62
COR36	137	119	137	128
COR37	93	92	104	101
COR38	131	130	133	131
COR39	72	95	82	103
COR40	33	53	41	53
COR41	63	66	64	74
COR42	130	128	130	130
COR43	123	118	122	116
COR44	103	106	95	102
COR45	136	136	135	134
COR46	106	114	92	108
COR47	120	122	120	125
COR48	134	132	132	131
FD1	126	126	118	122
FD2	14	14	18	17
FD3	14	13	14	15
FD4	3	2	2	1
FD5	53	25	41	13
FD6	27	38	41	53
FD7	29	33	37	43
FD8	36	30	31	28
FD9	7	9	7	11
FD10	95	108	107	116
FD11	8	7	9	8
FD12	6	3	8	2
FD13	69	84	66	85
FD14	127	127	127	129
FD15	92	29	15	19
FD16	11	12	4	9
FD17				
GA1	33	45	34	41
GA2	121	116	126	120
GA3	63	17	52	17
GA4	47	37	62	52
GA5	13	16	17	21
GA6	41	49	57	68
GA7	88	61	103	76
GA8	76	61	81	62
GA9	48	75	47	49

GA10	8	21	9	27
LG1	74	5	87	4
LG2	20	20	21	21
LG3	29	43	25	48
LG4	18	33	29	43
LG5	56	59	48	45
LG6	114	101	99	99
LG7	85	89	59	70
LG8	62	58	37	28
LG9	95	93	107	103
LG10	20	32	27	41
LG11	53	75	55	73
LG12	43	56	52	69
NFP1	133	135	134	135
NFP2	2	8	1	10
NFP3	83	94	84	95
NGP4	74	82	87	90
NGP5	82	85	90	88
NGP6	108	128	112	127
NGP7	102	86	115	91
NFP8	32	38	41	49
NGP9	135	134	136	136
SG1	124	124	57	95
SG2	26	27	40	39
SG3	25	17	19	26
SG4	109	105	113	105
SG5	65	55	50	34
SG6	70	47	70	37
SG7	77	80	85	86
SG8	41	35	35	47
SG9	113	103	94	93
SG10	60	27	65	30
SG11	56	53	76	70
SG12	48	72	63	82
SG13	29	64	25	57
SG14	51	45	39	33
SG15	4	3	3	2
SG16	90	102	78	88
SG17	105	70	104	66
SG18	17	15	21	16

SG19	104	63	93	36
SG20	110	113	116	118
SG21	28	19	35	23
SG22	23	59	15	45
SG23	39	51	29	35
SG24	70	70	70	57
SG25	45	73	55	83
SG26	50	43	70	62
SG27	44	35	32	30
SG28	12	64	13	57
SG29	23	21	23	19
SG30	81	79	85	77
SG31	116	24	123	32
SG32	38	73	48	83
SG33	8	40	9	55
SG34	122	99	129	112
SG35	95	75	106	78
SG36	65	67	54	60
SG37	99	96	77	74
SG38	88	87	97	92
SG39	22	10	32	7
SG40	118	109	124	114
SG41	128	125	119	113
SG42	55	31	68	24

Appendix 4-4 Manual Evaluations – Corporate Category

ID	Man Eval percentage of change	P1	P2	O1	O2	U1	U2	R1	R2	UNSUP1	UNSUP2	CRIT1	CRIT2	TVP1	TVP2	Avg. for Eval 1 with penalties	Rank Eval 1 with penalties	Avg. for Eval 2 with penalties	Rank Eval 2 with penalties	Avg. for Eval 1 no penalties	Rank Eval 1 no penalties	Avg. for Eval 2 no penalties	Rank Eval 2 no penalties
COR1	0.00%	214	212	71	78	7	8	107	101	0	0	25	25	424	424	84.8	45	84.8	45	79.8	44	79.8	46
COR2	18.35%	97	117	32	46	0	0	14	14	0	0	15	10	158	187	31.6	21	37.4	19	28.6	24	35.4	24
COR3	12.71%	67	73	27	36	6	5	13	13	0	0	5	5	118	133	23.6	12	26.6	14	22.6	18	25.4	17
COR4	70.92%	43	55	21	29	2	1	5	5	120	125	5	120	196	335	39.2	28	67	40	14.2	6	18	7
COR5	821.00%	69	1723	116	102	4	5	6	7	0	0	5	5	200	1842	40	29	368.4	47	39	36	367.4	48
COR6	20.00%	107	149	49	50	1	1	8	8	10	4	10	10	185	222	37	26	44.4	25	33	27	41.6	30
COR7	24.40%	105	146	13	47	5	5	66	47	15	15	5	0	209	260	41.8	32	52	30	37.8	33	49	36
COR8	12.85%	134	156	35	84	0	0	20	11	0	0	60	30	249	281	49.8	37	56.2	34	37.8	33	50.2	37
COR9	-5.05%	185	168	18	20	2	2	67	68	0	0	5	5	277	263	55.4	38	52.6	31	54.4	42	51.6	39
COR10	-3.18%	105	95	36	45	1	1	28	32	20	10	30	30	220	213	44	33	42.6	24	34	29	34.6	23
COR11	-8.70%	48	48	26	17	0	1	8	8	0	0	10	10	92	84	18.4	4	16.8	3	16.4	7	14.8	5
COR12	7.38%	53	58	21	23	5	5	28	30	0	0	15	15	122	131	24.4	14	26.2	13	21.4	14	23.2	15
COR13	-10.71%	23	20	0	0	0	0	5	5	0	0	0	0	28	25	5.6	1	5	1	5.6	1	5	1
COR14	-3.51%	45	52	42	30	1	1	21	22	0	0	5	5	114	110	22.8	10	22	8	21.8	16	21	11
COR15	7.24%	89	95	73	78	1	1	28	28	5	5	25	30	221	237	44.2	34	47.4	27	38.2	35	40.4	28
COR16	14.43%	44	57	45	44	0	0	3	5	0	5	5	0	97	111	19.4	7	22.2	9	18.4	10	21.2	12
COR17	-10.69%	68	72	31	35	3	3	17	17	20	10	20	5	159	142	31.8	22	28.4	15	23.8	19	25.4	17
COR18	1.10%	85	102	66	42	6	6	15	14	0	10	10	10	182	184	36.4	24	36.8	18	34.4	30	32.8	21
COR19	62.61%	43	115	36	36	13	13	8	8	0	0	15	15	115	187	23	11	37.4	19	20	11	34.4	22
COR20	72.92%	46	102	63	97	5	5	5	5	0	0	25	40	144	249	28.8	19	49.8	29	23.8	19	41.8	32
COR21	150.41%	23	19	34	12	0	0	11	10	55	55	0	212	123	308	24.6	15	61.6	37	13.6	5	8.2	3
COR22	22.81%	61	61	32	45	4	5	14	16	20	10	40	73	171	210	34.2	23	42	23	22.2	17	25.4	17
COR23	5.30%	157	168	45	45	20	20	35	40	45	45	0	0	302	318	60.4	41	63.6	38	51.4	41	54.6	41
COR24	-6.78%	15	23	19	16	1	1	14	15	0	0	10	0	59	55	11.8	2	11	2	9.8	3	11	4

COR25	17.20%	46	60	13	24	2	2	22	23	0	0	10	0	93	109	18.6	6	21.8	7	16.6	9	21.8	14
COR26	7.25%	48	41	30	39	0	0	30	23	0	15	30	30	138	148	27.6	18	29.6	16	21.6	15	20.6	10
COR27	1438.67%	125	136	31	56	5	5	14	15	3835	3250	0	0	4010	3462	45	35	692.4	48	35	31	42.4	33
COR28	3.05%	86	88	101	103	4	4	8	11	175	180	20	20	394	406	78.8	42	81.2	43	39.8	37	41.2	29
COR29	0.00%	21	21	6	6	1	1	5	5	70	70	0	0	103	103	20.6	8	20.6	5	6.6	2	6.6	2
COR30	20.27%	17	35	35	43	2	1	10	10	0	0	10	0	74	89	14.8	3	17.8	4	12.8	4	17.8	6
COR31	23.40%	96	128	38	54	6	6	28	35	0	0	20	10	188	232	37.6	27	46.4	26	33.6	28	44.6	34
COR32	15.25%	180	180	26	56	7	7	8	14	0	0	15	15	236	272	47.2	36	54.4	33	44.2	39	51.4	38
COR33	-4.55%	60	60	1	1	13	13	26	26	10	5	0	0	110	105	22	9	21	6	20	11	20	8
COR34	10.37%	60	69	42	45	5	5	18	20	0	0	10	10	135	149	27	16	29.8	17	25	21	27.8	20
COR35	-21.62%	65	73	39	18	5	2	29	13	0	0	10	10	148	116	29.6	20	23.2	11	27.6	23	21.2	12
COR36	-44.18%	227	167	243	96	9	8	17	11	0	5	45	15	541	302	108.2	48	60.4	36	99.2	48	56.4	42
COR37	4.35%	57	57	111	118	0	0	11	12	0	0	5	5	184	192	36.8	25	38.4	21	35.8	32	37.4	25
COR38	-10.64%	294	217	69	91	2	2	53	53	0	10	5	5	423	378	84.6	44	75.6	42	83.6	46	72.6	44
COR39	51.11%	89	149	29	37	0	0	7	8	0	0	10	10	135	204	27	16	40.8	22	25	21	38.8	27
COR40	21.74%	32	58	22	16	5	5	23	23	0	0	10	10	92	112	18.4	4	22.4	10	16.4	7	20.4	9
COR41	6.67%	60	69	28	31	3	3	14	15	0	0	15	10	120	128	24	13	25.6	12	21	13	23.6	16
COR42	-7.27%	254	230	100	96	5	5	10	14	0	0	30	25	399	370	79.8	43	74	41	73.8	43	69	43
COR43	1.03%	114	122	99	100	4	3	15	15	0	0	60	55	292	295	58.4	40	59	35	46.4	40	48	35
COR44	17.33%	121	145	29	38	2	2	10	7	0	0	40	45	202	237	40.4	30	47.4	27	32.4	26	38.4	26
COR45	-1.32%	351	357	82	79	0	0	11	11	30	35	55	40	529	522	105.8	47	104.4	46	88.8	47	89.4	47
COR46	28.85%	93	115	46	82	0	1	9	10	15	15	45	45	208	268	41.6	31	53.6	32	29.6	25	41.6	30
COR47	14.49%	128	142	85	103	0	0	6	15	0	0	64	64	283	324	56.6	39	64.8	39	43.8	38	52	40
COR48	-9.13%	258	217	101	96	4	5	41	45	0	5	45	40	449	408	89.8	46	81.6	44	80.8	45	72.6	44

Appendix 4-5 Manual Evaluations – State Government Category

ID	Perceivable 1	Perceivable 2	Operable 1	Operable 2	Understandable 1	Understandable 2	Robust 1	Robust 2	Unsupported Tech 1	Unsupported Tech 2	Critical 1	Critical 2	Total Violations 1	Total Violations 2	Average per page 1	Rank 1	Average per page 2	Rank 2	Average 1 no penalties	Rank 1 no penalties	Average 2 no penalties	Rank 2 no penalties	Manual eval percent of change
SG1	39	65	52	74	0	15	7	14	185	160	10	10	293	338	58.6	41	67.6	41	19.6	20	33.6	37	15.36%
SG2	49	51	20	30	1	1	11	8	0	0	0	0	81	90	16.2	9	18	8	16.2	15	18	16	11.11%
SG3	35	47	20	21	0	1	5	6	10	0	10	0	80	75	16	8	15	4	12	5	15	7	-6.25%
SG4	78	141	100	39	4	4	11	12	0	0	20	40	213	236	42.6	35	47.2	38	38.6	37	39.2	38	10.80%
SG5	27	31	59	47	1	1	4	5	0	0	30	30	121	114	24.2	23	22.8	19	18.2	17	16.8	12	-5.79%
SG6	47	38	44	31	4	5	14	15	20	15	5	5	134	109	26.8	25	21.8	16	21.8	24	17.8	15	-18.66%
SG7	88	92	28	30	0	0	12	16	10	10	0	0	138	148	27.6	27	29.6	32	25.6	30	27.6	33	7.25%
SG8	39	50	23	26	3	2	13	17	15	0	5	5	98	100	19.6	14	20	11	15.6	12	19	18	2.04%
SG9	114	118	30	30	0	0	15	15	65	65	0	0	224	228	44.8	37	45.6	37	31.8	33	32.6	36	1.79%
SG10	56	39	34	28	4	4	12	9	5	5	5	5	116	90	23.2	22	18	8	21.2	22	16	8	-22.41%
SG11	69	70	30	27	0	0	15	15	0	0	0	0	114	112	22.8	21	22.4	18	22.8	27	22.4	26	-1.75%
SG12	29	56	60	51	3	1	10	22	0	0	5	5	107	135	21.4	17	27	27	20.4	21	26	30	26.17%
SG13	46	64	12	20	0	2	11	18	15	20	0	0	84	124	16.8	11	24.8	22	13.8	8	20.8	20	47.62%
SG14	42	50	22	27	1	0	15	5	25	15	5	10	110	107	22	19	21.4	15	16	14	16.4	11	-2.73%
SG15	11	4	6	6	0	0	5	5	0	0	0	0	22	18	4.4	1	3.6	1	4.4	1	3	1	-18.18%
SG16	70	80	32	43	0	0	15	19	60	75	5	10	182	227	36.4	30	45.4	36	23.4	29	28.4	34	24.73%

SG17	63	35	67	39	1	0	48	35	0	0	25	25	204	134	40.8	34	26.8	25	35.8	35	21.8	25	-34.31%
SG18	48	35	12	20	0	2	5	5	0	0	0	5	65	67	13	4	13.4	3	13	6	12.4	3	3.08%
SG19	101	47	45	34	2	2	5	5	20	20	30	15	203	123	40.6	33	24.6	21	30.6	32	17.6	14	-39.41%
SG20	29	79	154	150	5	6	10	10	20	20	0	0	218	265	43.6	36	53	40	39.6	38	49	42	21.56%
SG21	56	52	13	12	0	3	9	6	0	0	5	5	83	75	16.6	10	15	4	15.6	12	14.6	5	-9.64%
SG22	29	56	12	23	4	5	8	10	0	0	25	25	78	119	15.6	6	23.8	20	10.6	4	18.8	17	52.56%
SG23	33	42	25	24	5	5	9	15	20	20	5	5	97	111	19.4	13	22.2	17	14.4	9	17.2	13	14.43%
SG24	70	68	13	19	7	7	19	10	25	30	0	0	134	134	26.8	25	26.8	25	21.8	24	20.8	20	0.00%
SG25	64	92	19	27	0	0	14	12	0	0	5	5	102	136	20.4	16	27.2	28	19.4	19	26.2	31	33.33%
SG26	57	61	30	33	2	2	20	10	0	0	0	0	109	106	21.8	18	21.2	14	21.8	24	21.2	24	-2.75%
SG27	50	52	13	17	3	1	10	10	25	20	0	0	101	100	20.2	15	20	11	15.2	10	16	8	-0.99%
SG28	32	63	8	17	5	5	5	19	0	20	5	0	55	124	11	3	24.8	22	10	3	20.8	20	125.45%
SG29	35	34	18	15	5	5	10	12	0	5	10	10	78	81	15.6	6	16.2	6	13.6	7	13.2	4	3.85%
SG30	72	70	43	35	4	4	9	13	20	20	5	5	153	147	30.6	28	29.4	31	25.6	30	24.4	28	-3.92%
SG31	197	42	24	21	4	4	13	14	0	0	5	5	243	86	48.6	38	17.2	7	47.6	40	16.2	10	-64.61%
SG32	58	83	10	30	3	1	18	17	0	0	5	5	94	136	18.8	12	27.2	28	17.8	16	26.2	31	44.68%
SG33	32	90	0	4	0	0	10	9	0	0	0	0	42	103	8.4	2	20.6	13	8.4	2	20.6	19	145.24%
SG34	86	54	194	150	6	4	5	5	0	0	0	5	291	218	58.2	40	43.6	35	58.2	42	42.6	39	-25.09%
SG35	81	65	74	38	6	2	22	22	0	0	5	10	188	137	37.6	31	27.4	30	36.6	36	25.4	29	-27.13%
SG36	68	57	13	36	2	1	13	11	25	25	0	0	121	130	24.2	23	26	24	19.2	18	21	23	7.44%

SG37	69	73	24	22	6	6	16	17	75	85	5	5	195	208	39	32	41.6	34	23	28	23.6	27	6.67%
SG38	82	74	14	13	9	11	61	64	0	0	10	10	176	172	35.2	29	34.4	33	33.2	34	32.4	35	-2.27%
SG39	21	26	50	4	0	0	5	5	0	0	0	15	76	50	15.2	5	10	2	15.2	10	7	2	-34.21%
SG40	122	121	112	94	3	2	5	6	20	20	10	5	272	248	54.4	39	49.6	39	48.4	41	44.6	41	-8.82%
SG41	101	99	97	95	5	5	15	15	110	110	35	20	363	344	72.6	42	68.8	42	43.6	39	42.8	40	-5.23%
SG42	79	48	18	16	0	0	11	10	0	0	5	20	113	94	22.6	20	18.8	10	21.6	23	14.8	6	-16.81%

Appendix 4-6 Manual Evaluations – Local Government Category

ID	Perceivable 1	Perceivable 2	Operable 1	Operable 2	Understandable 1	Understandable 2	Robust 1	Robust 2	Unsupported Tech. 1	Unsupported Tech. 2	Critical 1	Critical 2	Total Violations 1	Total Violations 2	Average per page 1	Rank 1	Average per page 2	Rank 2	Average per page no penalties 1	Rank 1 No penalties	Average per page no penalties 2	Rank 2 no penalties	Manual eval percent change
LG1	53	13	63	0	5	0	15	6	0	0	0	0	136	19	27.2	9	3.8	1	27.2	10	3.8	1	-86.03%
LG2	36	38	17	15	5	5	7	12	5	10	5	0	75	80	15	2	16	2	13	1	14	2	6.67%
LG3	29	44	33	46	2	1	5	5	0	0	15	10	84	106	16.8	4	21.2	5	13.8	2	19.2	7	26.19%
LG4	49	65	10	18	5	4	8	6	0	0	0	5	72	98	14.4	1	19.6	4	14.4	4	18.6	5	36.11%
LG5	53	53	24	29	1	1	11	11	20	20	5	5	114	119	22.8	7	23.8	8	17.8	6	18.8	6	4.39%
LG6	65	70	76	92	5	5	24	9	35	30	25	20	230	226	46	12	45.2	12	34	11	35.2	11	-1.74%
LG7	65	85	24	17	0	0	10	10	55	55	5	20	159	187	31.8	10	37.4	10	19.8	9	22.4	9	17.61%
LG8	34	34	34	33	4	5	7	6	35	35	5	5	119	118	23.8	8	23.6	7	15.8	5	15.6	3	-0.84%
LG9	165	137	17	31	1	21	5	5	0	0	0	0	188	194	37.6	11	38.8	11	37.6	12	38.8	12	3.19%
LG10	50	64	11	11	2	5	7	12	0	0	5	5	75	97	15	2	19.4	3	14	3	18.4	4	29.33%
LG11	47	56	41	46	5	5	4	10	10	15	5	5	112	137	22.4	6	27.4	9	19.4	8	23.4	10	22.32%
LG12	60	64	25	37	5	5	5	5	0	0	5	5	100	116	20	5	23.2	6	19	7	22.2	8	16.00%

Appendix 4-7 Manual Evaluations – Not-for-profit Category

ID	Perceivable 1	Perceivable 2	Operable 1	Operable 2	Understandable 1	Understandable 2	Robust 1	Robust 2	Unsupported Tech. 1	Unsupported Tech. 2	Critical Violations 1	Critical Violations 2	Total Violations 1	Total Violations 2	Average per page with penalties 1	Rank 1	Average per page with penalties 2	Rank 2	Average per page without penalties 1	Rank 1 no penalties	Average per page without penalties 2	Rank 2 no penalties	Manual eval percent change
NFP1	329	318	75	109	3	4	33	37	0	10	0	5	440	483	88	8	96.6	9	88	8	93.6	8	9.77%
NFP2	0	13	0	22	0	0	5	5	0	0	0	0	5	40	1	1	8	1	1	1	8	1	700.00%
NFP3	86	103	28	54	2	1	10	10	25	25	5	5	156	198	31.2	5	39.6	6	25.2	3	33.6	6	26.92%
NGP4	64	66	65	76	1	1	6	6	0	0	0	0	136	149	27.2	3	29.8	3	27.2	4	29.8	4	9.56%
NGP5	75	90	52	38	5	3	8	11	0	0	15	15	155	157	31	4	31.4	4	28	5	28.4	3	1.29%
NGP6	108	103	68	156	1	1	15	15	15	90	5	5	212	370	42.4	7	74	7	38.4	6	55	7	74.53%
NGP7	104	81	35	35	7	8	50	32	0	0	5	5	201	161	40.2	6	32.2	5	39.2	7	31.2	5	-19.90%
NFP8	49	51	28	41	0	0	5	5	0	0	5	5	87	102	17.4	2	20.4	2	16.4	2	19.4	2	17.24%
NGP9	357	346	109	112	5	5	10	10	0	0	5	5	486	478	97.2	9	95.6	8	96.2	9	94.6	9	-1.65%

Appendix 4-8 Manual Evaluation - Government Affiliate Category

ID	Perceivable 1	Perceivable 2	Operable 1	Operable 2	Understandable 1	Understandable 2	Robust 1	Robust 2	Unsupported Tech. 1	Unsupported Tech. 2	Critical Violations 1	Critical Violations 2	Total Violations 1	Total Violations 2	Average per page with penalties 1	Rank 1	Average per page with penalties 2	Rank 2	Average per page without penalties 1	Manual Rank 1 no penalties	Average per page without penalties 2	Manual Rank 2 no penalties	Manual eval percent of change
GA1	33	40	29	29	6	6	9	17	0	0	15	15	92	107	18.4	3	21.4	5	15.4	3	18.4	4	16.30%
GA2	154	147	68	63	6	6	33	33	20	20	5	5	286	274	57.2	10	54.8	10	52.2	10	49.8	10	-4.20%
GA3	48	44	27	16	11	1	9	4	15	10	10	0	120	75	24	7	15	2	19	5	13	1	-37.50%
GA4	49	38	35	38	8	6	9	19	0	0	5	0	106	101	21.2	5	20.2	4	20.2	7	20.2	6	-4.72%
GA5	35	41	14	19	2	3	5	7	0	0	0	0	56	70	11.2	2	14	1	11.2	2	14	2	25.00%
GA6	51	65	39	34	1	1	7	10	0	0	0	0	98	110	19.6	4	22	6	19.6	6	22	8	12.24%
GA7	146	95	16	19	0	0	14	7	0	0	0	0	176	121	35.2	9	24.2	7	35.2	9	24.2	9	-31.25%
GA8	79	62	33	34	1	1	9	9	0	0	15	15	137	121	27.4	8	24.2	7	24.4	8	21.2	7	-11.68%
GA9	42	43	35	44	0	0	10	10	5	25	15	15	107	137	21.4	6	27.4	9	17.4	4	19.4	5	28.04%
GA10	26	37	10	33	1	1	5	5	0	0	0	5	42	81	8.4	1	16.2	3	8.4	1	15.2	3	92.86%

Appendix 4-9 Automated Evaluation – Federal Government

ID	A1	A1_ %	A2	A2_ %	A3	A3_ %	A4	A4_ %	A5	A5_ %	A6	A6_ %	A7	A7_ %
FD1	24	1.25	29	1.50	70	3.67	69	3.57	72	3.72	72	2.71	66	3.32
FD2	35	2.03	36	2.03	86	4.99	87	5.03	101	5.83	99	5.68	98	5.59
FD3	75	3.78	79	7.19	198	9.97	158	7.96	194	9.76	188	9.48	183	9.21
FD4	75	4.55	76	4.64	168	9.35	169	9.37	176	10.12			188	10.59
FD5	56	2.89	61	3.14	110	5.73	118	6.14	134	6.91			78	4.02
FD6	60	3.37	72	3.91	172	9.58	167	9.26	176	9.70	176	9.78	67	3.98
FD7	76	3.82	82	4.13	155	7.79	154	7.74	181	9.10	184	9.28	160	8.15
FD8	70	3.52	82	4.15	210	10.58	209	10.53	206	10.35	208	10.45	199	9.98
FD9	91	4.57	116	5.83	254	12.74	254	12.74	262	13.15	256	12.84	260	13.06
FD10	51	2.67	77	4.04	132	6.93	136	7.08	147	7.69	147	7.71	136	7.09
FD11	28	1.64	48	2.83	88	5.16	89	5.23	104	6.06	104	6.09	107	6.21
FD12	36	1.81	46	2.32	49	2.47	81	4.08	79	3.98	65	3.31	95	4.84
FD13	131	6.97	164	8.60	303	15.79	299	15.56	309	15.68	315	16.08	321	16.39
FD14	87	4.51	108	5.56	226	12.11	199	10.35	244	12.33	225	11.38	228	11.51
FD15	81	4.10	82	4.14	181	9.10	184	9.25	108	5.58	81	4.17	102	5.28
FD17	163	8.24	198	9.94	185	9.57	197	10.34	189	10.56	227	11.43	185	10.55
FD16			74	3.73	118	5.92	110	5.52	111	5.73	113	5.79	143	7.33

Appendix 4-10 Automated Evaluation – Not-for-profit Category

ID	A1	A1_%	A2	A2_%	A3	A3_%	A4	A4_%	A5		A5_%	A6	A6_%	A7	A7_%
NFP1	78	7.26	190	14.39	204	14.59	196	13.85	221		11.24	212	10.77	208	10.59
NFP2	59	2.98	98	4.95	103	5.21	97	4.89	91		4.60	94	4.76	176	9.17
NFP3	79	4.06	131	11.91	130	11.81	132	12.30	133		11.77	124	10.40	143	8.79
NFP4	90	4.58	202	10.28	207	10.53	206	10.51	189		9.60	188	9.61	184	9.34
NFP5	110	11.10	241	24.92	256	27.86	243	26.07	198		35.42	218	36.21	87	14.19
NFP6					101	6.62	104	6.83	102		7.03	104	5.70	94	4.72
NFP7	22	10.09	43	24.71	45	22.84	46	22.55	29		8.98	29	8.26	34	10.37
NFP8	73	4.37	189	10.86	192	11.00	187	10.71	199		10.05	202	10.22	220	11.39
NFP9	57	3.27	139	7.59	139	7.77	121	6.97	163		9.06	148	8.22	149	8.31

Appendix 4-11 Automated Evaluation – State Government Category

ID	A1	A1_%	A2	A2_%	A3	A3_%	A4	A4_%	A5	A5_%	A6	A6_%	A7	A7_%
SG1	142	7.15	147	7.38	179	8.95	184	18.24	184	9.23	181	9.06	93	4.79
SG2	125	6.26	144	7.21	316	15.86	314	15.78	308	15.43	286	14.35	281	14.09
SG3	136	6.89	185	9.37	185	9.35	185	9.37	162	8.17	149	7.53	143	7.21
SG4	120	6.10	146	7.41	102	11.47	102	11.10	108	11.76	107	11.35		
SG5	128	6.46	147	7.42	73	14.69	74	14.98	76	14.42	72	13.82	66	12.82
SG6	99	5.14	120	6.22	149	8.51	149	8.51	97	8.13	96	8.21	98	8.31
SG7	109	5.51	133	6.72	209	10.51	205	10.31	205	10.31	200	10.07	197	9.89
SG8	118	6.14	137	7.12	192	9.75	205	10.41	233	11.86	220	11.22	179	9.97
SG9	109	5.53	129	6.53	127	10.03	207	10.41	205	10.31	211	10.61	212	10.67
SG10	110	5.54	128	6.44	1435	7.26	147	7.36	147	7.36	147	7.36	149	7.46
SG11	134	6.84	73	15.02	57	14.04	228	11.83	248	12.79			60	15.58
SG12	108	5.52	124	6.33	192	10.67	189	11.62	154	12.13	199	12.62	179	10.98
SG13	97	4.86	118	5.90	275	13.76	274	13.71	312	15.61			297	14.87
SG14	127	6.42	145	7.34	250	12.63	263	13.31	267	13.57	184	9.36	195	9.90
SG15	88	4.57	114	5.88	150	9.07	158	8.22	131	7.05			146	7.38

SG16	112	5.66	141	7.28	201	10.12	201	10.12	202	10.21	171	8.66	145	7.33
SG17	125	6.37	161	8.36	33	9.02	33	9.02	34	9.34	120	6.05	101	5.10
SG18	103	5.27	135	6.99	77	4.12	79	4.21	119	5.96	116	5.81	117	5.87
SG19	109	5.53	1407	71.64	1382	70.69	91	4.61	137	6.97	132	6.67	145	7.32
SG20	109	5.53	94	4.75	140	7.07	141	7.12	140	7.06	192	9.75	179	9.10
SG21	108	5.47	1231	62.42	684	34.67	134	6.80	226	11.45	221	11.20	242	12.28
SG22	107	5.58	1339	69.74	84	7.08	136	11.42	136	11.36	141	11.88	113	13.33
SG23														
SG24	76	4.17	107	5.52	179	9.15	176	9.00	172	9.35	165	8.76	144	7.78
SG25	123	6.25	129	10.50	135	10.75	134	10.76	143	11.61	152	10.48	175	11.81
SG26	140	7.15	142	7.26	141	7.21	157	7.96	164	8.29			193	9.74
SG27	109	5.54	127	10.03	131	10.12	131	10.23	136	10.72	149	9.93	166	11.43
SG28	120	6.09	92	10.77	91	10.64	91	10.64	101	11.88	100	11.78	98	11.44
SG29	124	6.86	106	20.15	109	22.02	121	12.67	111	14.45			101	18.70
SG30	96	4.99	214	11.05	213	11.00	no data	n/a	220	11.36			226	11.73
SG31	129	6.74	205	10.76	239	12.47	235	12.27	251	13.01	244	12.55	236	12.97
SG32	66	3.31	165	8.28	164	8.23	170	8.53	168	8.43	166	8.32	162	8.11
SG33	90	4.50	170	8.50	159	7.95	157	7.85	149	7.46			150	7.51

SG34	110	5.56	115	10.40	115	10.37	115	10.36	211	21.73	229	21.09	69	5.39
SG35	109	5.55	27	5.56	27	5.56	27	5.56	31	6.39	31	6.77	34	7.34
SG36	115	5.81	170	8.53	179	8.97	17	0.85	196	10.19			201	10.34
SG37	100	5.09	180	9.07	161	8.11	160	8.06	170	8.57	181	9.11	174	8.76
SG38	83	4.19	177	8.89	209	10.50	211	10.60	220	11.09	211	10.64	236	11.89
SG39	79	4.00	186	9.33	188	9.42	187	9.55	209	10.66	208	10.66	152	7.67
SG40	97	4.94	218	11.11	218	11.11	205	10.44	199	10.12	198	10.07	199	10.09
SG41														
SG42	135	7.67	223	13.03	222	13.02	227	13.50	227	13.01	255	14.37	141	8.03

Appendix 4-12 Automated Evaluation – Local Government Category

ID	A1	A1_%	A2	A2_%	A3	A3_%	A4	A4_%	A5	A5_%	A6	A6_%	A7	A7_%
LG1	103	5.19	257	13.01	264	13.35	246	12.43	242	12.22	242	12.51	240	12.12
LG2														
LG3	110	5.56	223	11.29	226	11.44	206	10.41	25	14.12	233	11.71	225	11.30
LG4	98	5.11	193	10.05	201	10.46	208	10.84	207	10.82	190	9.61	160	8.37
LG5	104	5.27	166	8.34	165	8.29	169	8.50	174	8.72	180	9.05	195	9.78
LG6	94	4.72	145	7.26	184	9.93	179	9.67	182	9.86	189	10.32	185	10.05
LG7	73	4.11	215	12.15	218	12.29	221	12.42	232	12.98	216	12.00	208	11.56
LG8	128	6.47	165	10.93	163	10.11	162	9.77	200	10.30	199	10.24	162	8.99
LG9	72	3.70	151	7.72	151	7.73	147	7.53	184	9.44	168	8.64	165	8.51
LG10	73	3.67	169	8.48	160	8.02	165	8.27	184	9.23	174	8.73	250	12.63
LG11	73	3.68	139	6.99	143	7.18	146	7.34	147	7.40	145	7.30	146	7.34
LG12	95	5.65	142	11.12	140	10.23	128	9.26	148	7.60	174	8.74	195	9.79

Appendix 4-13 Automated Evaluation – Corporate Category – Count and percentage of total pages assessed

ID	A1	A1%	A2	A2%	A3	A3%	A4	A4%	A5	A5%	A6	A6%	A7	A7%
COR1	45	2.26	120	6.09	176	8.91	NA	NA	182	9.25	184	9.29	171	8.67
COR2	32	1.61	95	4.75	101	5.05	NA	NA	107	5.36	NA	NA	103	5.15
COR3	57	2.97	163	8.82	159	8.69	158	9.58	172	10.53	NA	NA	173	10.47
COR4	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
COR5	40	2.06	111	5.65	113	5.73	143	7.28	142	7.48	126	6.57	138	7.29
COR6	71	3.58	213	10.75	213	10.75	213	10.77	199	10.06	200	10.09	187	9.41
COR7	57	3.00	138	7.03	123	6.27	138	7.07	158	14.88	155	7.82	162	8.18
COR8	81	4.35	87	4.49	108	5.55	110	5.68	119	6.01	156	7.88	154	7.84
COR9	17	10.69	38	23.90	38	24.05	38	24.05	30	18.18	39	23.64	20	14.29
COR10	79	4.07	173	9.35	177	9.60	181	9.13	219	21.32	212	10.99	171	8.94
COR11	53	3.60	165	11.52	164	12.08	162	11.84	91	5.94	81	5.11	97	6.14
COR12	63	3.34	153	8.13	152	8.09	166	8.91	168	8.98	165	8.81	160	8.51
COR13	37	1.87	85	4.31	86	4.36	86	4.36	68	3.41	70	3.51	74	3.71
COR14	82	4.48	172	9.51	167	9.21	151	8.45	180	9.88	169	9.32	115	6.37
COR15	NA	NA	183	10.73	184	10.42	184	10.69	181	9.81	182	9.77	174	9.65
COR16	84	4.21	221	11.09	230	11.53	235	11.77	265	13.30	272	13.65	255	12.79
COR17	81	4.44	168	10.64	167	10.50	167	10.49	162	10.90	125	8.39	93	7.27
COR18	76	3.86	108	11.04	109	9.65	115	9.29	162	8.20	160	8.08	135	6.79
COR19	63	3.16	157	7.86	191	9.57	193	9.67	170	8.52	175	8.78	156	7.82
COR20	95	5.15	241	12.85	245	13.07	240	12.58	238	12.44	NA	NA	249	12.96
COR21	105	5.29	266	19.37	261	19.02	357	23.20	356	22.75	NA	NA	NA	17.19
COR22	82	4.33	184	9.74	188	9.95	186	9.84	176	9.04	174	9.09	193	10.09
COR23	102	5.34	202	10.61	201	10.55	199	10.44	228	11.94	222	11.64	213	11.12
COR24	123	6.33	258	13.31	290	14.93	258	13.32	274	14.09	310	15.92	94	4.82
COR25	86	4.36	225	11.38	209	10.59	219	11.09	163	12.61	160	11.15	138	6.93

COR26	75	9.11	204	13.96	203	14.57	204	14.99	245	16.14	201	13.01	114	5.74
COR27	112	5.68	247	12.64	184	9.22	186	9.32	202	10.22	198	10.04	200	10.11
COR28	23	3.36	73	10.96	73	11.04	73	11.20	74	11.31	72	11.86	74	11.62
COR29	NA	NA	78	6.49	71	5.89	76	6.27	116	6.34	116	6.25	104	5.27
COR30	60	3.39	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
COR31	106	5.46	202	10.87	226	12.21	195	11.00	213	14.18	194	12.13	181	11.09
COR32	85	4.41	186	9.49	230	11.74	190	9.70	208	10.62	204	10.42	204	10.37
COR33	27	20.00	48	34.04	48	34.04	49	34.29	49	34.75	49	34.51	48	33.80
COR34	41	2.20	125	8.46	131	8.64	131	8.60	167	10.42	170	10.26	165	9.27
COR35	16	10.60	31	20.13	31	20.13	31	20.13	31	20.00	31	19.75	36	20.34
COR36	27	4.80	63	11.52	63	11.50	63	11.48	67	12.32	67	12.14	70	11.73
COR37	114	6.11	337	17.16	326	16.62	278	14.22	289	15.16			306	16.10
COR38	68	3.85	213	12.99	206	12.78	206	12.71	201	10.98	196	10.72	188	9.85
COR39			94	4.98	228	11.72	221	11.36	233	11.98	271	14.27	280	14.84
COR40	111	6.62	270	14.24	283	14.79	237	12.43	202	11.10	193	9.83	198	10.14
COR41	92	4.78	232	11.87	235	12.04	232	11.88	230	12.02	199	10.44	207	10.79
COR42	75	4.01	102	5.40	93	4.95	96	5.11	111	5.88	101	9.27	91	4.75
COR43	59	3.00	186	9.45	194	9.83	191	9.68	206	10.46	199	10.12	199	10.04
COR44	NA	NA	67	3.44	110	5.91	106	5.59	NA	NA	NA	NA	NA	NA
COR45	82	4.69	135	7.53	116	6.29	114	6.46	147	7.80	101	5.45	121	6.62
COR46	69	3.88	172	9.48	159	8.52	146	8.32	NA	NA	NA	NA	NA	NA
COR47	84	5.36	140	9.17	127	7.80	128	8.27	131	6.74	136	7.08	146	7.46
COR48	62	3.30	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Appendix 4-14 Automated Evaluation – Government-affiliated Category

ID	A1	A1%	A2	A2%	A3	A3%	A4	A4%	A5	A5%	A6	A6%	A7	A7%
GA1	68	5.57	179	15.05	186	15.23	185	14.97	179	14.49	174	15.80	179	15.78
GA2	84	4.20	206	10.31	233	11.67	234	11.71	227	11.36	230	11.51	235	11.76
GA3	39	10.24	104	28.18	104	28.03	104	28.03	87	24.44	87	24.44	72	31.72
GA4	135	6.90	291	14.98	277	14.32	272	14.12	289	14.89	273	14.00	224	11.72
GA5	112	5.97	88	5.64	109	5.98	110	6.04	129	7.23	130	7.27	131	7.26
GA6	107	5.54	76	6.20	76	7.20	86	6.71	97	5.23	104	5.75	127	7.15
GA7	122	6.16	311	15.73	308	15.55	301	15.19	191	9.72	164	8.38	157	7.94
GA8	102	5.22	310	15.65	291	14.70	299	15.14	319	16.12	316	15.94	331	16.73
GA9	100	5.33	256	13.55	233	12.37	238	12.79	243	13.11	228	12.35	230	12.20
GA10	121	11.91	213	11.08	214	11.12	213	11.09	223	11.76	223	11.76	212	10.89

Appendix 4-15 rank for Worst-performing Websites (all methods)

Website	Manual – Eval 2	User Testing	Automated – Eval 7
COR1	133	120	52
COR3	78	126	81
COR19	97	126	41
COR23	126	101	90
COR33	51	39	128
COR36	128	22	99
COR38	131	136	67
COR42	130	136	6
COR43	116	138	72
COR45	134	58	21
COR46	108	126	N/A
COR47	125	126	36
COR48	131	101	N/A
FD13	85	126	95
FD14	129	126	95
GA2	120	126	101
GA3	17	58	127
NFP1	135	101	83
NFP4	90	126	61
NFP5	88	126	115
NFP6	127	82	5
NFP9	136	126	47

Appendix 4-16 User Testing – Colour Contrast and Readability

ID	colour contrast & readability	colour contrast	readability	font style	acronyms & abbrev
FD1	4	Fail	Pass	Pass	Pass
FD2	3	Fail	Pass	Fail	Pass
FD3	5	Pass	Pass	Pass	Pass
FD4	4	Pass	Fail	Pass	Pass
FD5	5	Pass	Pass	Pass	Pass
FD6	4	Pass	Pass	Fail	Pass
FD7	3	Fail	Pass	Fail	Pass
FD8	3	Pass	Fail	Pass	Fail
FD9	3	Fail	Pass	Fail	Pass
FD10	4	Fail	Pass	Pass	Pass
FD11	4	Pass	Fail	Pass	Pass
FD12	5	Pass	Pass	Pass	Pass
FD13	3	Fail	Pass	Fail	Pass
FD14	3	Fail	Pass	Fail	Pass
FD15	5	Pass	Pass	Pass	Pass
FD17	4	Pass	Fail	Pass	Pass
FD16	5	Pass	Pass	Pass	Pass
SG1	4	Fail	Pass	Pass	Pass
SG2	4	Fail	Pass	Pass	Pass
SG3	4	Fail	Pass	Pass	Pass
SG4	3	Fail	Fail	Pass	Pass
SG5	5	Pass	Pass	Pass	Pass
SG6	4	Fail	Pass	Pass	Pass
SG7	3	Fail	Fail	Pass	Pass
SG8	3	Pass	Fail	Fail	Pass
SG9	2	Fail	Fail	Pass	Fail
SG10	5	Pass	Pass	Pass	Pass
SG11	4	Fail	Pass	Pass	Pass
SG12	4	Fail	Pass	Pass	Pass
SG13	5	Pass	Pass	Pass	Pass
SG14	4	Fail	Pass	Pass	Pass
SG15	4	Pass	Fail	Pass	Pass
SG16	4	Fail	Pass	Pass	Pass
SG17	5	Pass	Pass	Pass	Pass
SG18	4	Fail	Pass	Pass	Pass
SG19	4	Fail	Pass	Pass	Pass
SG20	4	Fail	Pass	Pass	Pass
SG21	3	Fail	Fail	Pass	Pass

SG22	3	Fail	Fail	Pass	Pass
SG23	3	Fail	Pass	Pass	Fail
SG24	4	Fail	Pass	Pass	Pass
SG25	4	Fail	Pass	Pass	Pass
SG26	4	Fail	Pass	Pass	Pass
SG27	4	Fail	Pass	Pass	Pass
SG28	2	Fail	Fail	Fail	Pass
SG29	4	Fail	Pass	Pass	Pass
SG30	4	Fail	Pass	Pass	Pass
SG31	3	Fail	Fail	Pass	Pass
SG32	5	Pass	Pass	Pass	Pass
SG33	4	Fail	Pass	Pass	Pass
SG34	4	Fail	Pass	Pass	Pass
SG35	5	Pass	Pass	Pass	Pass
SG36	5	Pass	Pass	Pass	Pass
SG37	3	Fail	Pass	Fail	Pass
SG38	4	Fail	Pass	Pass	Pass
SG39	5	Pass	Pass	Pass	Pass
SG40	3	Fail	Pass	Fail	Pass
SG41	4	Fail	Pass	Pass	Pass
SG42	3	Fail	Pass	Fail	Pass
LG1	4	Fail	Pass	Pass	Pass
LG2	4	Fail	Pass	Pass	Pass
LG3	4	Pass	Pass	Pass	Fail
LG4	3	Fail	Pass	Fail	Pass
LG5	4	Fail	Pass	Pass	Pass
LG6	4	Fail	Pass	Pass	Pass
LG7	4	Pass	Pass	Fail	Pass
LG8	4	Fail	Pass	Pass	Pass
LG9	4	Fail	Pass	Pass	Pass
LG10	4	Fail	Pass	Pass	Pass
LG11	3	Fail	Pass	Pass	Fail
LG12	2	Fail	Pass	Fail	Fail
GA1	5	Pass	Pass	Pass	Pass
GA2	3	Fail	Fail	Pass	Pass
GA3	4	Fail	Pass	Pass	Pass
GA4	4	Fail	Pass	Pass	Pass
GA5	5	Pass	Pass	Pass	Pass
GA6	3	Fail	Pass	Pass	Fail
GA7	3	Fail	Fail	Pass	Pass
GA8	4	Fail	Pass	Pass	Pass
GA9	3	Fail	Pass	Fail	Pass
GA10	3	Fail	Fail	Pass	Pass
NFP1	4	Fail	Pass	Pass	Pass
NFP2	3	Fail	Pass	Pass	Fail

NFP3	3	Fail	Pass	Pass	Fail
NFP4	2	Fail	Pass	Fail	Fail
NFP5	3	Fail	Fail	Pass	Pass
NFP6	2	Fail	Pass	Fail	Fail
NFP7	4	Fail	Pass	Pass	Pass
NFP8	4	Fail	Pass	Pass	Pass
NFP9	2	Fail	Fail	Fail	Pass
COR1	3	Fail	Fail	Pass	Pass
COR2	4	Fail	Pass	Pass	Pass
COR3	3	Fail	Fail	Pass	Pass
COR4	3	Fail	Pass	Fail	Pass
COR5	4	Fail	Pass	Pass	Pass
COR6	4	Fail	Pass	Pass	Pass
COR7	5	Pass	Pass	Pass	Pass
COR8	3	Pass	Fail	Fail	Pass
COR9	4	Fail	Pass	Pass	Pass
COR10	4	Fail	Pass	Pass	Pass
COR11	4	Fail	Pass	Pass	Pass
COR12	4	Fail	Pass	Pass	Pass
COR13	3	Fail	Pass	Pass	Fail
COR14	4	Fail	Pass	Pass	Pass
COR15	4	Fail	Pass	Pass	Pass
COR16	4	Fail	Pass	Pass	Pass
COR17	4	Fail	Pass	Pass	Pass
COR18	4	Fail	Pass	Pass	Pass
COR19	3	Fail	Pass	Fail	Pass
COR20	3	Fail	Pass	Pass	Fail
COR21	4	Pass	Fail	Pass	Pass
COR22	4	Fail	Pass	Pass	Pass
COR23	2	Fail	Pass	Fail	Fail
COR24	4	Fail	Pass	Pass	Pass
COR25	4	Fail	Pass	Pass	Pass
COR26	4	Fail	Pass	Pass	Pass
COR27	5	Pass	Pass	Pass	Pass
COR28	4	Fail	Pass	Pass	Pass
COR29	3	Fail	Pass	Pass	Fail
COR30					
COR31	4	Fail	Pass	Pass	Pass
COR32	4	Fail	Pass	Pass	Pass
COR33	3	Fail	Pass	Fail	Pass
COR34	3	Fail	Pass	Fail	Pass
COR35	3	Fail	Pass	Fail	Pass
COR36	4	Fail	Pass	Pass	Pass
COR37	5	Pass	Pass	Pass	Pass
COR38	3	Fail	Pass	Fail	Pass

COR39	4	Fail	Pass	Pass	Pass
COR40	4	Fail	Pass	Pass	Pass
COR41	3	Fail	Pass	Pass	Fail
COR42	3	Fail	Pass	Fail	Pass
COR43	2	Fail	Pass	Fail	Fail
COR44	2	Fail	Fail	Pass	Fail
COR45	4	Fail	Pass	Pass	Pass
COR46	4	Fail	Pass	Pass	Pass
COR47	3	Fail	Pass	Fail	Pass
COR48	4	Fail	Pass	Pass	Pass

Appendix 4-17 User Testing – Keyboard Only

ID	Keyboard only	high-lighting	tab order	skip navigation	moving content
FD1	2	Fail	Fail	Pass	Fail
FD2	5	Pass	Pass	Pass	Pass
FD3	5	Pass	Pass	Pass	Pass
FD4	4	Pass	Pass	Fail	Pass
FD5	3	Pass	Pass	Fail	Fail
FD6	5	Pass	Pass	Pass	Pass
FD7	5	Pass	Pass	Pass	Pass
FD8	3	Pass	Fail	Fail	Pass
FD9	3	Fail	Pass	Pass	Fail
FD10	2	Fail	Fail	Fail	Pass
FD11	5	Pass	Pass	Pass	Pass
FD12	5	Pass	Pass	Pass	Pass
FD13	1	Fail	Fail	Fail	Fail
FD14	2	Pass	Fail	Fail	Fail
FD15	4	Pass	Pass	Pass	Fail
FD17	5	Pass	Pass	Pass	Pass
FD16	3	Pass	Pass	Fail	Fail
SG1	1	Fail	Fail	Fail	Fail
SG2	1	Fail	Fail	Fail	Fail
SG3	1	Fail	Fail	Fail	Fail
SG4	3	Pass	Fail	Pass	Fail
SG5	1	Fail	Fail	Fail	Fail
SG6	3	Fail	Fail	Pass	Pass
SG7	2	Fail	Fail	Fail	Pass
SG8	2	Fail	Fail	Pass	Fail
SG9	2	Fail	Fail	Fail	Pass
SG10	1	Fail	Fail	Fail	Fail
SG11	2	Fail	Fail	Pass	Fail
SG12	3	Fail	Pass	Pass	Fail
SG13	1	Fail	Fail	Fail	Fail
SG14	2	Fail	Fail	Fail	Pass
SG15	5	Pass	Pass	Pass	Pass
SG16	1	Fail	Fail	Fail	Fail
SG17	4	Pass	Fail	Pass	Pass
SG18	1	Fail	Fail	Fail	Fail
SG19	4	Fail	Pass	Pass	Pass
SG20	2	Fail	Fail	Fail	Pass
SG21	2	Fail	Fail	Fail	Pass
SG22	1	Fail	Fail	Fail	Fail
SG23	3	Fail	Pass	Fail	Pass

SG24	1	Fail	Fail	Fail	Fail
SG25	2	Fail	Fail	Fail	Pass
SG26	1	Fail	Fail	Fail	Fail
SG27	2	Fail	Fail	Fail	Pass
SG28	3	Fail	Pass	Fail	Pass
SG29	3	Fail	Pass	Fail	Pass
SG30	1	Fail	Fail	Fail	Fail
SG31	1	Fail	Fail	Fail	Fail
SG32	2	Fail	Fail	Pass	Fail
SG33	4	Fail	Pass	Pass	Pass
SG34	2	Fail	Fail	Pass	Fail
SG35	1	Fail	Fail	Fail	Fail
SG36	2	Fail	Fail	Fail	Pass
SG37	3	Pass	Fail	Pass	Fail
SG38	1	Fail	Fail	Fail	Fail
SG39	3	Fail	Fail	Pass	Pass
SG40	1	Fail	Fail	Fail	Fail
SG41	3	Fail	Pass	Fail	Pass
SG42	3	Pass	Fail	Fail	Pass
LG1	5	Pass	Pass	Pass	Pass
LG2	3	Fail	Pass	Fail	Pass
LG3	3	Fail	Fail	Pass	Pass
LG4	3	Fail	Pass	Pass	Fail
LG5	2	Fail	Fail	Fail	Pass
LG6	1	Fail	Fail	Fail	Fail
LG7	2	Pass	Fail	Fail	Fail
LG8	1	Fail	Fail	Fail	Fail
LG9	3	Fail	Pass	Fail	Pass
LG10	2	Fail	Pass	Fail	Fail
LG11	3	Pass	Fail	Fail	Pass
LG12	3	Fail	Pass	Pass	Fail
GA1	3	Fail	Pass	Pass	Fail
GA2	1	Fail	Fail	Fail	Fail
GA3	2	Fail	Fail	Fail	Pass
GA4	4	Fail	Pass	Pass	Pass
GA5	4	Fail	Pass	Pass	Pass
GA6	2	Fail	Fail	Pass	Fail
GA7	3	Fail	Fail	Pass	Pass
GA8	1	Fail	Fail	Fail	Fail
GA9	1	Fail	Fail	Fail	Fail
GA10	1	Fail	Fail	Fail	Fail
NFP1	1	Fail	Fail	Fail	Fail
NFP2	3	Pass	Fail	Fail	Pass
NFP3	1	Fail	Fail	Fail	Fail
NFP4	3	Fail	Pass	Fail	Pass

NFP5	1	Fail	Fail	Fail	Fail
NFP6	3	Fail	Pass	Fail	Pass
NFP7	1	Fail	Fail	Fail	Fail
NFP8	1	Fail	Fail	Fail	Fail
NFP9	1	Fail	Fail	Fail	Fail
COR1	1	Fail	Fail	Fail	Fail
COR2	2	Fail	Fail	Pass	Fail
COR3	1	Fail	Fail	Fail	Fail
COR4	1	Fail	Fail	Fail	Fail
COR5	1	Fail	Fail	Fail	Fail
COR6	1	Fail	Fail	Fail	Fail
COR7	2	Fail	Fail	Fail	Pass
COR8	1	Fail	Fail	Fail	Fail
COR9	1	Fail	Fail	Fail	Fail
COR10	2	Pass	Fail	Fail	Pass
COR11	1	Fail	Fail	Fail	Fail
COR12	2	Pass	Fail	Fail	Pass
COR13	4	Pass	Pass	Fail	Pass
COR14	4	Pass	Pass	Fail	Pass
COR15	1	Fail	Fail	Fail	Fail
COR16	4	Fail	Pass	Pass	Pass
COR17	3	Fail	Pass	Fail	Pass
COR18	2	Fail	Pass	Fail	Fail
COR19	1	Fail	Fail	Fail	Fail
COR20	1	Fail	Fail	Fail	Fail
COR21	4	Pass	Pass	Pass	Fail
COR22	2	Fail	Pass	Fail	Fail
COR23	3	Pass	Pass	Fail	Fail
COR24	2	Fail	Fail	Fail	Pass
COR25	4	Pass	Pass	Fail	Pass
COR26	2	Fail	Fail	Fail	Pass
COR27	3	Fail	Pass	Fail	Pass
COR28	3	Fail	Pass	Fail	Pass
COR29	3	Pass	Fail	Pass	Fail
COR30	4	Pass	Pass	Fail	Pass
COR31	2	Fail	Fail	Fail	Pass
COR32	1	Fail	Fail	Fail	Fail
COR33	3	Fail	Pass	Fail	Pass
COR34	1	Fail	Fail	Fail	Fail
COR35	1	Fail	Fail	Fail	Fail
COR36	2	Fail	Pass	Fail	Fail
COR37	1	Fail	Fail	Fail	Fail
COR38	1	Fail	Fail	Fail	Fail
COR39	1	Fail	Fail	Fail	Fail
COR40	1	Fail	Fail	Fail	Fail

COR41	1	Fail	Fail	Fail	Fail
COR42	1	Fail	Fail	Fail	Fail
COR43	1	Fail	Fail	Fail	Fail
COR44	1	Fail	Fail	Fail	Fail
COR45	1	Fail	Fail	Fail	Fail
COR46	1	Fail	Fail	Fail	Fail
COR47	1	Fail	Fail	Fail	Fail
COR48	1	Fail	Fail	Fail	Fail

Appendix 4-18 User Testing – Low Vision

ID	Low Vision	text re-sizing	widgets	font style	page magnification
FD1	4	Fail	Pass	Pass	Pass
FD2	4	Pass	Pass	Fail	Pass
FD3	2	Fail	Fail	Pass	Fail
FD4	4	Pass	Fail	Pass	Pass
FD5	4	Pass	Fail	Pass	Pass
FD6	3	Pass	Fail	Fail	Pass
FD7	1	Fail	Fail	Fail	Fail
FD8	4	Pass	Pass	Pass	Fail
FD9	2	Fail	Fail	Fail	Pass
FD10	4	Pass	Fail	Pass	Pass
FD11	5	Pass	Pass	Pass	Pass
FD12	2	Fail	Fail	Pass	Fail
FD13	2	Fail	Fail	Fail	Pass
FD14	3	Fail	Fail	Fail	Pass
FD15	3	Fail	Fail	Pass	Pass
FD17		Fail	Fail	Pass	Fail
FD16	2	Fail	Fail	Pass	Fail
SG1	4	Fail	Pass	Pass	Pass
SG2	4	Fail	Pass	Pass	Pass
SG3	4	Fail	Pass	Pass	Pass
SG4	2	Fail	Fail	Pass	Fail
SG5	3	Fail	Fail	Pass	Pass
SG6	3	Fail	Pass	Pass	Fail
SG7	4	Pass	Pass	Pass	Fail
SG8	2	Fail	Pass	Fail	Fail
SG9	3	Fail	Pass	Pass	Fail
SG10	3	Fail	Pass	Pass	Fail
SG11	3	Pass	Fail	Pass	Fail
SG12	2	Fail	Fail	Pass	Fail
SG13	5	Pass	Pass	Pass	Pass
SG14	4	Fail	Pass	Pass	Pass
SG15	5	Pass	Pass	Pass	Pass
SG16	5	Pass	Pass	Pass	Pass
SG17	4	Fail	Pass	Pass	Pass
SG18	5	Pass	Pass	Pass	Pass
SG19	2	Fail	Fail	Pass	Fail
SG20	2	Fail	Fail	Pass	Fail
SG21	2	Fail	Fail	Pass	Fail
SG22	3	Fail	Fail	Pass	Pass
SG23	2	Fail	Fail	Pass	Fail

SG24	2	Fail	Fail	Pass	Fail
SG25	3	Fail	Pass	Pass	Fail
SG26	3	Fail	Pass	Pass	Fail
SG27	4	Fail	Pass	Pass	Pass
SG28	1	Fail	Fail	Fail	Fail
SG29	4	Pass	Pass	Pass	Fail
SG30	3	Fail	Pass	Pass	Fail
SG31	5	Pass	Pass	Pass	Pass
SG32	3	Fail	Fail	Pass	Pass
SG33	4	Fail	Pass	Pass	Pass
SG34	4	Fail	Pass	Pass	Pass
SG35	3	Fail	Fail	Pass	Pass
SG36	3	Fail	Fail	Pass	Pass
SG37	3	Fail	Pass	Fail	Pass
SG38	3	Fail	Pass	Pass	Fail
SG39	4	Pass	Pass	Pass	Fail
SG40	3	Pass	Fail	Fail	Pass
SG41	5	Pass	Pass	Pass	Pass
SG42	2	Fail	Pass	Fail	Fail
LG1	5	Pass	Pass	Pass	Pass
LG2	3	Fail	Pass	Pass	Fail
LG3	2	Fail	Fail	Pass	Fail
LG4	2	Fail	Pass	Fail	Fail
LG5	4	Fail	Pass	Pass	Pass
LG6	3	Fail	Pass	Pass	Fail
LG7	3	Pass	Pass	Fail	Fail
LG8	4	Pass	Pass	Pass	Fail
LG9	3	Pass	Fail	Pass	Fail
LG10	4	Pass	Pass	Pass	Fail
LG11	3	Fail	Pass	Pass	Fail
LG12	2	Fail	Pass	Fail	Fail
GA1	2	Fail	Fail	Pass	Fail
GA2	3	Fail	Fail	Pass	Pass
GA3	4	Fail	Pass	Pass	Pass
GA4	4	Fail	Pass	Pass	Pass
GA5	3	Fail	Pass	Pass	Fail
GA6	4	Fail	Pass	Pass	Pass
GA7	4	Fail	Pass	Pass	Pass
GA8	3	Fail	Pass	Pass	Fail
GA9	3	Fail	Pass	Fail	Pass
GA10	4	Pass	Pass	Pass	Fail
NFP1	4	Fail	Pass	Pass	Pass
NFP2	1	Fail	Fail	Fail	Fail
NFP3	4	Fail	Pass	Pass	Pass
NFP4	1	Fail	Fail	Fail	Fail

NFP5	3	Fail	Pass	Pass	Fail
NFP6	2	Fail	Fail	Fail	Pass
NFP7	4	Fail	Pass	Pass	Pass
NFP8	4	Fail	Pass	Pass	Pass
NFP9	3	Fail	Pass	Fail	Pass
COR1	4	Fail	Pass	Pass	Pass
COR2	4	Fail	Pass	Pass	Pass
COR3	4	Fail	Pass	Pass	Pass
COR4	2	Fail	Pass	Fail	Fail
COR5	3	Fail	Pass	Pass	Fail
COR6	3	Fail	Pass	Pass	Fail
COR7	3	Fail	Pass	Pass	Fail
COR8	2	Fail	Pass	Fail	Fail
COR9	3	Fail	Pass	Pass	Fail
COR10	3	Fail	Pass	Pass	Fail
COR11	3	Fail	Pass	Pass	Fail
COR12	3	Fail	Pass	Pass	Fail
COR13	3	Fail	Pass	Pass	Fail
COR14	3	Fail	Pass	Pass	Fail
COR15	3	Fail	Pass	Pass	Fail
COR16	3	Fail	Fail	Pass	Pass
COR17	3	Pass	Pass	Pass	Fail
COR18	4	Fail	Pass	Pass	Pass
COR19	3	Pass	Fail	Fail	Pass
COR20	4	Fail	Pass	Pass	Pass
COR21	3	Fail	Pass	Pass	Fail
COR22	4	Fail	Pass	Pass	Pass
COR23	1	Fail	Fail	Fail	Fail
COR24	5	Pass	Pass	Pass	Pass
COR25	5	Pass	Pass	Pass	Pass
COR26	5	Pass	Pass	Pass	Pass
COR27					
COR28	4	Fail	Pass	Pass	Pass
COR29	5	Pass	Pass	Pass	Pass
COR30	4	Pass	Pass	Pass	Fail
COR31	4	Fail	Pass	Pass	Pass
COR32	4	Fail	Pass	Pass	Pass
COR33	3	Fail	Pass	Fail	Pass
COR34	3	Fail	Pass	Fail	Pass
COR35	2	Fail	Pass	Fail	Fail
COR36	3	Fail	Fail	Pass	Pass
COR37	4	Pass	Pass	Pass	Fail
COR38	2	Fail	Pass	Fail	Fail
COR39	4	Pass	Pass	Pass	Fail
COR40	4	Pass	Pass	Pass	Fail

COR41	4	Pass	Pass	Pass	Fail
COR42	2	Fail	Pass	Fail	Fail
COR43	2	Fail	Pass	Fail	Fail
COR44	4	Fail	Pass	Pass	Pass
COR45	4	Fail	Pass	Pass	Pass
COR46	3	Fail	Pass	Pass	Fail
COR47	3	Fail	Pass	Fail	Pass
COR48	3	Fail	Pass	Pass	Fail

Appendix 4-19 User Testing – Screen Reader

ID	Screen reader	links	headings	images	form fields
FD1	2	Fail	Fail	Pass	Fail
FD2	4	Fail	Pass	Pass	Pass
FD3	3	Fail	Pass	Pass	Fail
FD4	3	Fail	Fail	Pass	Pass
FD5	4	Pass	Fail	Pass	Pass
FD6	5	Pass	Pass	Pass	Pass
FD7	2	Fail	Fail	Pass	Fail
FD8	3	Fail	Pass	Pass	Fail
FD9	1	Fail	Fail	Fail	Fail
FD10	1	Fail	Fail	Fail	Fail
FD11	5	Pass	Pass	Pass	Pass
FD12	2	Fail	Fail	Fail	Pass
FD13	1	Fail	Fail	Fail	Fail
FD14	1	Fail	Fail	Fail	Fail
FD15	5	Pass	Pass	Pass	Pass
FD17	3	Fail	Fail	Pass	Pass
FD16	4	Pass	Fail	Pass	Pass
SG1	3	Fail	Pass	Fail	Pass
SG2	1	Fail	Fail	Fail	Fail
SG3	3	Fail	Fail	Pass	Pass
SG4	2	Fail	Pass	Fail	Fail
SG5	3	Fail	Fail	Pass	Pass
SG6	2	Fail	Fail	Pass	Fail
SG7	1	Fail	Fail	Fail	Fail
SG8	2	Fail	Fail	Pass	Fail
SG9	3	Pass	Pass	Fail	Fail
SG10	1	Fail	Fail	Fail	Fail
SG11	2	Fail	Fail	Fail	Pass
SG12	1	Fail	Fail	Fail	Fail
SG13	2	Fail	Fail	Fail	Pass
SG14	3	Fail	Fail	Pass	Pass
SG15	5	Pass	Pass	Pass	Pass
SG16	2	Fail	Pass	Fail	Fail
SG17	3	Fail	Fail	Pass	Pass
SG18	2	Fail	Fail	Fail	Pass
SG19	2	Fail	Fail	Fail	Pass
SG20	1	Fail	Fail	Fail	Fail
SG21	2	Fail	Pass	Fail	Fail
SG22	2	Fail	Fail	Pass	Fail
SG23	2	Fail	Fail	Pass	Fail
SG24	1	Fail	Fail	Fail	Fail
SG25	1	Fail	Fail	Fail	Fail

SG26	1	Fail	Fail	Fail	Fail
SG27	3	Pass	Fail	Pass	Fail
SG28	3	Fail	Pass	Fail	Pass
SG29	2	Fail	Fail	Fail	Pass
SG30	1	Fail	Fail	Fail	Fail
SG31	1	Fail	Fail	Fail	Fail
SG32	1	Fail	Fail	Fail	Fail
SG33	4	Fail	Pass	Pass	Pass
SG34	3	Fail	Fail	Pass	Pass
SG35	2	Fail	Fail	Fail	Pass
SG36	3	Fail	Pass	Fail	Pass
SG37	4	Fail	Pass	Pass	Pass
SG38	2	Fail	Pass	Fail	Fail
SG39	2	Fail	Fail	Fail	Pass
SG40	2	Fail	Fail	Fail	Pass
SG41	3	Fail	Fail	Pass	Pass
SG42	3	Fail	Fail	Pass	Pass
LG1	3	Fail	Fail	Pass	Pass
LG2	2	Fail	Fail	Fail	Pass
LG3	2	Fail	Fail	Fail	Pass
LG4	4	Fail	Pass	Pass	Pass
LG5	1	Fail	Fail	Fail	Fail
LG6	3	Fail	Pass	Pass	Fail
LG7	2	Fail	Fail	Pass	Fail
LG8	3	Fail	Fail	Pass	Pass
LG9	2	Fail	Fail	Pass	Fail
LG10	2	Fail	Fail	Pass	Fail
LG11	3	Fail	Pass	Fail	Pass
LG12	3	Fail	Pass	Pass	Fail
GA1	2	Fail	Pass	Fail	Fail
GA2	1	Fail	Fail	Fail	Fail
GA3	1	Fail	Fail	Fail	Fail
GA4	2	Fail	Fail	Pass	Fail
GA5	3	Fail	Pass	Fail	Pass
GA6	2	Fail	Fail	Pass	Fail
GA7	3	Fail	Fail	Pass	Pass
GA8	2	Fail	Fail	Fail	Pass
GA9	4	Fail	Pass	Pass	Pass
GA10	1	Fail	Fail	Fail	Fail
NFP1	2	Fail	Pass	Fail	Fail
NFP2	3	Pass	Fail	Fail	Pass
NFP3	1	Fail	Fail	Fail	Fail
NFP4	1	Fail	Fail	Fail	Fail
NFP5	1	Fail	Fail	Fail	Fail
NFP6	1	Fail	Fail	Fail	Fail

NFP7	1	Fail	Fail	Fail	Fail
NFP8	3	Fail	Pass	Fail	Pass
NFP9	3	Pass	Fail	Fail	Pass
COR1	1	Fail	Fail	Fail	Fail
COR2	2	Fail	Fail	Pass	Fail
COR3	1	Fail	Fail	Fail	Fail
COR4	3	Fail	Pass	Pass	Fail
COR5	2	Fail	Fail	Pass	Fail
COR6	1	Fail	Fail	Fail	Fail
COR7	2	Fail	Pass	Fail	Fail
COR8	1	Fail	Fail	Fail	Fail
COR9	3	Fail	Fail	Pass	Pass
COR10	2	Fail	Fail	Pass	Fail
COR11	2	Fail	Pass	Fail	Fail
COR12	1	Fail	Fail	Fail	Fail
COR13	2	Fail	Fail	Fail	Pass
COR14	2	Fail	Fail	Pass	Fail
COR15	1	Fail	Fail	Fail	Fail
COR16	3	Fail	Fail	Pass	Pass
COR17	2	Fail	Fail	Pass	Fail
COR18	1	Fail	Fail	Fail	Fail
COR19	1	Fail	Fail	Fail	Fail
COR20	2	Fail	Fail	Fail	Pass
COR21	3	Fail	Fail	Pass	Pass
COR22	2	Fail	Fail	Pass	Fail
COR23	1	Fail	Fail	Fail	Fail
COR24	1	Fail	Fail	Fail	Fail
COR25	3	Fail	Pass	Fail	Pass
COR26	2	Fail	Fail	Pass	Fail
COR27	4	Pass	Pass	Pass	Fail
COR28	1	Fail	Fail	Fail	Fail
COR29	3	Fail	Fail	Pass	Pass
COR30	4	Fail	Pass	Pass	Pass
COR31	1	Fail	Fail	Fail	Fail
COR32	1	Fail	Fail	Fail	Fail
COR33	2	Pass	Fail	Fail	Fail
COR34	3	Fail	Pass	Pass	Fail
COR35	2	Fail	Fail	Pass	Fail
COR36	4	Fail	Pass	Pass	Pass
COR37	3	Pass	Pass	Fail	Fail
COR38	2	Fail	Fail	Pass	Fail
COR39	3	Fail	Fail	Pass	Pass
COR40	1	Fail	Fail	Fail	Fail
COR41	3	Fail	Pass	Fail	Pass
COR42	1	Fail	Fail	Fail	Fail

COR43	1	Fail	Fail	Fail	Fail
COR44	2	Fail	Fail	Fail	Pass
COR45	2	Fail	Fail	Pass	Fail
COR46	1	Fail	Fail	Fail	Fail
COR47	1	Fail	Fail	Fail	Fail
COR48	1	Fail	Fail	Fail	Fail

Appendix 4-20 User Testing – Voice Activation

ID	Voice Activation	links	form fields	navigation	multimedia
FD1	2	Fail	Pass	Fail	Fail
FD2	5	Pass	Pass	Pass	Pass
FD3	2	Pass	Fail	Fail	Fail
FD4	4	Fail	Pass	Pass	Pass
FD5	3	Fail	Pass	Pass	Fail
FD6	3	Fail	Pass	Fail	Pass
FD7	3	Fail	Pass	Fail	Pass
FD8	3	Fail	Pass	Fail	Pass
FD9	3	Fail	Pass	Pass	Fail
FD10	3	Fail	Pass	Fail	Pass
FD11	5	Pass	Pass	Pass	Pass
FD12	3	Fail	Pass	Pass	Fail
FD13	3	Fail	Pass	Pass	Fail
FD14	2	Fail	Pass	Fail	Fail
FD15	3	Fail	Pass	Pass	Fail
FD17	4	Pass	Pass	Fail	Pass
FD16	3	Fail	Pass	Pass	Fail
SG1	3	Pass	Pass	Fail	Fail
SG2	1	Fail	Fail	Fail	Fail
SG3	4	Fail	Pass	Pass	Pass
SG4	4	Pass	Pass	Pass	Fail
SG5	3	Pass	Pass	Fail	Fail
SG6	4	Pass	Pass	Fail	Pass
SG7	4	Fail	Pass	Pass	Pass
SG8	3	Fail	Pass	Fail	Pass
SG9	5	Pass	Pass	Pass	Pass
SG10	4	Pass	Pass	Pass	Fail
SG11	3	Pass	Pass	Fail	Fail
SG12	3	Pass	Pass	Fail	Fail
SG13	3	Fail	Pass	Fail	Pass
SG14	2	Fail	Pass	Fail	Fail
SG15	4	Pass	Pass	Fail	Pass
SG16	2	Fail	Pass	Fail	Fail
SG17	5	Pass	Pass	Pass	Pass
SG18	2	Fail	Pass	Fail	Fail
SG19	1	Fail	Fail	Fail	Fail
SG20	3	Fail	Pass	Fail	Pass
SG21	4	Fail	Pass	Pass	Pass
SG22	2	Fail	Pass	Fail	Fail
SG23	3	Pass	Fail	Fail	Pass

SG24	3	Pass	Pass	Fail	Fail
SG25	2	Fail	Fail	Fail	Pass
SG26	3	Pass	Pass	Fail	Fail
SG27	4	Pass	Pass	Fail	Pass
SG28	4	Fail	Pass	Pass	Pass
SG29	5	Pass	Pass	Pass	Pass
SG30	3	Fail	Pass	Fail	Pass
SG31	2	Pass	Fail	Fail	Fail
SG32	2	Fail	Pass	Fail	Fail
SG33	2	Fail	Pass	Fail	Fail
SG34	2	Fail	Pass	Fail	Fail
SG35	2	Fail	Pass	Fail	Fail
SG36	2	Fail	Pass	Fail	Fail
SG37	4	Pass	Pass	Pass	Fail
SG38	2	Fail	Pass	Fail	Fail
SG39	4	Pass	Pass	Fail	Pass
SG40	4	Pass	Pass	Pass	Fail
SG41	4	Fail	Pass	Pass	Pass
SG42	3	Fail	Pass	Fail	Pass
LG1	3	Fail	Pass	Fail	Pass
LG2	4	Pass	Pass	Fail	Pass
LG3	4	Pass	Pass	Fail	Pass
LG4	3	Pass	Pass	Fail	Fail
LG5	3	Fail	Pass	Fail	Pass
LG6	3	Pass	Pass	Fail	Fail
LG7	3	Fail	Pass	Fail	Pass
LG8	2	Fail	Pass	Fail	Fail
LG9	3	Fail	Pass	Fail	Pass
LG10	2	Fail	Pass	Fail	Fail
LG11	4	Pass	Pass	Pass	Fail
LG12	3	Fail	Pass	Fail	Pass
GA1	2	Fail	Pass	Fail	Fail
GA2	2	Fail	Pass	Fail	Fail
GA3	3	Fail	Pass	Fail	Pass
GA4	4	Pass	Pass	Fail	Pass
GA5	5	Pass	Pass	Pass	Pass
GA6	3	Fail	Pass	Pass	Fail
GA7	3	Fail	Pass	Fail	Pass
GA8	3	Pass	Pass	Fail	Fail
GA9	4	Pass	Pass	Pass	Fail
GA10	4	Fail	Pass	Pass	Pass
NFP1	1	Fail	Fail	Fail	Fail
NFP2	1	Fail	Fail	Fail	Fail
NFP3	3	Fail	Pass	Pass	Fail
NFP4	3	Fail	Pass	Fail	Pass

NFP5	2	Pass	Fail	Fail	Fail
NFP6	5	Pass	Pass	Pass	Pass
NFP7	4	Pass	Pass	Fail	Pass
NFP8	3	Fail	Pass	Pass	Fail
NFP9	1	Fail	Fail	Fail	Fail
COR1	2	Fail	Pass	Fail	Fail
COR2	1	Fail	Fail	Fail	Fail
COR3	1	Fail	Fail	Fail	Fail
COR4	3	Pass	Fail	Fail	Pass
COR5	2	Fail	Pass	Fail	Fail
COR6	4	Pass	Pass	Pass	Fail
COR7	3	Fail	Pass	Fail	Pass
COR8	5	Pass	Pass	Pass	Pass
COR9	2	Fail	Pass	Fail	Fail
COR10	2	Fail	Fail	Pass	Fail
COR11	3	Pass	Fail	Fail	Pass
COR12	3	Pass	Pass	Fail	Fail
COR13	4	Pass	Pass	Fail	Pass
COR14	5	Pass	Pass	Pass	Pass
COR15	2	Fail	Pass	Fail	Fail
COR16	3	Fail	Pass	Fail	Pass
COR17	4	Pass	Pass	Fail	Pass
COR18	3	Fail	Pass	Pass	Fail
COR19	2	Fail	Pass	Fail	Fail
COR20	3	Fail	Pass	Pass	Fail
COR21	4	Pass	Pass	Pass	Fail
COR22	3	Fail	Pass	Fail	Pass
COR23	5	Pass	Pass	Pass	Pass
COR24	4	Fail	Pass	Pass	Pass
COR25	4	Fail	Pass	Pass	Pass
COR26	1	Fail	Fail	Fail	Fail
COR27	3	Fail	Pass	Fail	Pass
COR28	3	Fail	Pass	Fail	Pass
COR29	1	Fail	Fail	Fail	Fail
COR30	4	Pass	Pass	Fail	Pass
COR31	1	Fail	Fail	Fail	Fail
COR32	2	Fail	Pass	Fail	Fail
COR33	4	Fail	Pass	Pass	Pass
COR34	3	Fail	Pass	Pass	Fail
COR35	4	Pass	Pass	Pass	Fail
COR36	4	Fail	Pass	Pass	Pass
COR37	2	Fail	Pass	Fail	Fail
COR38	1	Fail	Fail	Fail	Fail
COR39	3	Pass	Pass	Fail	Fail
COR40	1	Fail	Fail	Fail	Fail

COR41	2	Fail	Pass	Fail	Fail
COR42	2	Fail	Pass	Fail	Fail
COR43	2	Fail	Pass	Fail	Fail
COR44	3	Fail	Pass	Fail	Pass
COR45	3	Fail	Pass	Pass	Fail
COR46	1	Fail	Fail	Fail	Fail
COR47	2	Fail	Fail	Pass	Fail
COR48	3	Fail	Pass	Pass	Fail

Appendix 4-21 User Testing – Overall Scores

ID	Overall score /25	# of Fails /20	Ranking
FD1	14	11	55
FD2	21	4	3
FD3	17	8	19
FD4	19	6	10
FD5	19	6	10
FD6	20	5	5
FD7	14	11	55
FD8	16	9	26
FD9	12	13	98
FD10	14	11	55
FD11	24	1	1
FD12	17	8	19
FD13	10	15	125
FD14	11	15	117
FD15	20	5	5
FD17	16	7	26
FD16	17	8	19
Mean Score	16.53		
SG1	15	10	37
SG2	11	14	117
SG3	16	9	26
SG4	14	11	55
SG5	15	10	37
SG6	16	9	26
SG7	14	11	55
SG8	12	13	98
SG9	15	10	37
SG10	14	11	55
SG11	14	11	55
SG12	13	12	77
SG13	16	9	26
SG14	15	10	37
SG15	23	2	2
SG16	14	11	55
SG17	21	4	3
SG18	14	11	55
SG19	13	12	77
SG20	12	13	98
SG21	13	12	77
SG22	11	14	117
SG23	13	12	77

SG24	11	14	117
SG25	12	13	98
SG26	12	13	98
SG27	17	8	19
SG28	13	12	77
SG29	18	7	13
SG30	12	13	98
SG31	12	13	98
SG32	13	12	77
SG33	18	7	13
SG34	15	10	37
SG35	13	12	77
SG36	15	10	37
SG37	17	8	19
SG38	12	13	98
SG39	18	7	13
SG40	13	12	77
SG41	19	6	10
SG42	14	11	55
Mean	14.48		
LG1	20	5	5
LG2	16	9	26
LG3	15	10	37
LG4	15	10	37
LG5	14	11	55
LG6	14	11	55
LG7	14	11	55
LG8	14	11	55
LG9	15	10	37
LG10	14	11	55
LG11	16	9	26
LG12	13	12	77
Mean	15.0		
GA1	14	11	55
GA2	10	15	125
GA3	14	11	55
GA4	18	7	13
GA5	20	5	5
GA6	14	11	55
GA7	16	9	26
GA8	13	12	77
GA9	15	10	37
GA10	13	12	77
Mean	14.70		
NFP1	12	13	98

NFP2	11	14	117
NFP3	12	13	98
NFP4	10	15	125
NFP5	10	15	125
NFP6	13	12	77
NFP7	14	11	55
NFP8	15	10	37
NFP9	10	15	125
Mean	11.89		
COR1	11	14	117
COR2	13	12	77
COR3	10	15	125
COR4	12	13	98
COR5	12	13	98
COR6	13	12	77
COR7	15	10	37
COR8	12	13	98
COR9	13	12	77
COR10	13	11	77
COR11	13	12	77
COR12	13	11	77
COR13	16	9	26
COR14	18	7	13
COR15	11	14	117
COR16	17	8	19
COR17	16	8	26
COR18	14	11	55
COR19	10	15	125
COR20	13	12	77
COR21	18	7	13
COR22	15	10	37
COR23	12	13	98
COR24	16	9	26
COR25	20	5	5
COR26	14	11	55
COR27			#N/A
COR28	15	10	37
COR29	15	10	37
COR30			#N/A
COR31	12	13	98
COR32	12	13	98
COR33	15	10	37
COR34	13	12	77
COR35	12	13	98
COR36	17	8	19

COR37	15	10	37
COR38	9	16	134
COR39	15	10	37
COR40	11	14	117
COR41	13	12	77
COR42	9	16	134
COR43	8	17	136
COR44	12	13	98
COR45	14	11	55
COR46	10	15	125
COR47	10	15	125
COR48	12	13	98
Mean	13.24		

Appendix 4-22 Website Accessibility in Australia - Survey #3

Q1.1 (Q.1.1) Please paste the provided identification number here.

Q1.2 (Q.1.2) Please choose the ownership/management category that best describes this website.

- federal government (1)
- state/territory government (2)
- Local Government (3)
- Government-Affiliated e.g. power utility (4)
- Not-For-Profit organisation (5)
- commercial organisation (6)

Q1.3 (Q.1.3) Which of the following most represents your client/user base.

- Senior citizens (1)
- Young families (2)
- Married couples (3)
- Single adults (4)
- Children or teenagers (5)
- A combination of the above (6)
- Other (please specify) (7) _____

Q2.1 (Q.2.1) The following questions relate to the Australian Government's Website Accessibility National Transition Strategy, referred to as the 'NTS'. The current requirements for website accessibility in Australia are known as the Web Content Accessibility Guidelines, Version 2.0, which have been developed by the W3C and are referred to as WCAG 2.0. Please assess each statement according to the scale shown as it relates to this website. Links are provided below to the NTS and WCAG 2.0: NTS: <http://www.finance.gov.au/publications/wcag-2-implementation/docs/wcag-transition-strategy.pdf> WCAG 2.0: <http://www.w3.org/TR/WCAG20/>

	Strongly Agree (1)	Agree (2)	Neither Agree nor Disagree (3)	Disagree (4)	Strongly Disagree (5)
We are aware of WCAG 2.0. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We understand the differences between WCAG 2.0 A, AA and AAA compliance. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We are aware of the NTS. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We are aware of the W3C. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This website comes under the compliance requirements of the NTS. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This website does not come under the requirements of the NTS. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This website does not come under the requirements of the NTS, however we are working according to the NTS work-plan to achieve WCAG 2.0 compliance. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

<p>This website does not come under the NTS, and we are working on a different work-plan to achieve WCAG 2.0 compliance. (8)</p>	○	○	○	○	○
<p>This website does not come under the NTS, and we are not currently working towards WAG 2.0 compliance. (9)</p>	○	○	○	○	○
<p>We are aware of the current website accessibility compliance requirements in Australia. (10)</p>	○	○	○	○	○
<p>We are aware of WCAG 2.0, however have not yet commenced working towards website accessibility guideline compliance. (11)</p>	○	○	○	○	○
<p>We are not aware of WCAG 2.0 or how it might or might not apply to this website. (12)</p>	○	○	○	○	○
<p>There is a person in this organisation who is responsible for the website accessibility process. (13)</p>	○	○	○	○	○

Q2.2 (Q.2.2) Please mention any details regarding question 2.1 above, which you feel are relevant to the website accessibility compliance situation with this website.

Q2.3 (Q.2.3) what do you see as the most critical issues relating to website accessibility for your organisation?

Q2.4 (Q.2.4) what do you see as the most critical issues relating to website accessibility in Australia?

Q2.5 (Q.2.5) I am aware of the following Web, Accessibility and Usability tools.

	strongly agree (1)	Agree (2)	Neither Agree nor Disagree (3)	Disagree (4)	Strongly Disagree (5)
W3C Online Compliance Check (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
SortSite (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
TotalValidator (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
JAWS screen reader (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
NVDA screen reader (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Web Accessibility Tool Bar (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
IBM Rational Policy Tester Accessibility Edition (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other (comment below) (8)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q2.6 If you answered 'other' in question 2.5, please provide details of other tools that you either use or are aware.

Q3.1 (Q.3.1) When was this website last audited for accessibility guideline compliance?

- less than 1 month ago (1)
- more than 1 month, but less than 3 months ago (2)
- more than 3 months, but less than six months ago (3)
- more than six months, but less than 1 year ago (4)
- more than one year ago (5)
- never (6)
- currently in progress (7)

Q3.2 (Q.3.2) To which standard has your website been audited for accessibility compliance?

- WCAG 1.0 (1)
- WCAG 2.0 (2)
- other (3)
- unknown (4)
- It hasn't been audited as far as I am aware (5)

Q3.3 (Q.3.3) If you answered 'other' to question 3.2 above, please explain.

Q3.4 (Q.3.4) To the best of my knowledge, this website is currently compliant to:

- WCAG 1.0 A (1)
- WCAG 1.0 AA (2)
- WCAG 1.0 AAA (3)
- WCAG 2.0 A (4)
- WCAG 2.0 AA (5)
- WCAG 2.0 AAA (6)
- unknown (7)

Q3.5 (Q.3.5) Referring to question 3.4 above, how has this standard has been verified?

- by an internal audit (1)
- by an external audit (2)
- unverified (3)

Q3.6 (Q.3.6) What were the auditing techniques and tools used in this previous website accessibility audit?

Q3.7 (Q.3.7) What are your future plans for website accessibility testing? Please specify.

Q4.1 (Q.4.1) How would you describe the progress in achieving website accessibility compliance to WCAG 2.0 Priority Level A?

	Strongly agree (1)	Agree (2)	Neither Agree nor Disagree (3)	Disagree (4)	Strongly Disagree (5)
We believe our website is now compliant to WCAG 2.0 A (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We experienced some problems in meeting WCAG2.0 Level A by December 2012. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It was not possible to meet WCAG 2.0 Level A by December 2012. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We do not believe the December 2012 deadline applied to this website. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We had already met WCAG 2.0 A before the December 2012 deadline. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We attempted to comply, we do not feel that the December 2012 deadline was feasible for our organisation. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q4.2 (Q.4.2) Please indicate which of the following choices indicate barriers to achieving WCAG 2.0 A compliance in relation to this website (choose as many as are applicable).

- Time (1)
- Cost/budget (2)
- Technical Ability (3)
- Management support (4)
- Available staff (5)
- All of the above named possible barriers (6)
- Other barrier (7) _____

Q5.1 (Q.5.1) We are currently experiencing difficulty understanding the WCAG 2.0 Level A requirements?

- yes (1)
- no (2)
- not applicable (3)

Q5.2 (Q.5.2) What is the most difficult technical issue you are facing with regard to website accessibility compliance?

Q5.3 (Q.5.3) Are you aware of the issue of inaccessible PDF documents and the obstacles they may create for users with assistive technology?

- Yes (1)
- No (2)

Q5.4 Are you aware of the requirement for Australian Government websites to provide documents in (at least) two formats and that they should include accessibility features? (AGIMO Blog: <http://agimo.gov.au/2012/09/20/pdf-accessibility-becomes-iso-standard/>)

- Yes (1)
- No (2)

Q5.5 How has your use of PDF documents changed over the past year?

- increased (1)
- decreased (2)
- stayed the same (3)

Q5.6 (Q.5.4) With regard to documents in PDF format, how have you decided to deal with this issue?

- we will probably ignore the guidelines for this issue (1)
- we will provide alternative formats for all PDF documents (2)
- we have a planned strategy to convert PDF documents to a more accessible format (3)
- we are archiving all PDF documents created before July 1, 2010 and providing new documents in a different format, or a choice of formats (4)
- we believing PDF formats will become acceptable and so have decided to 'wait and see' (5)
- we do not use PDF formats on our website (6)
- we have not yet made a decision (7)
- other (8) _____

Q5.7 (Q.5.5) Does this website require users to enter data, such as online travel, banking details, employment applications etc.?

- yes (1)
- No (2)

Q5.8 (Q.5.6) Please answer these questions relating for form design.

	Strongly agree (1)	Agree (2)	Neither Agree nor Disagree (3)	Disagree (4)	Strongly Disagree (5)
This website includes forms for user completion. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The forms on this website includes error detection features. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The forms on this website clearly indicate the location and nature of user error. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q6.1 (Q.6.1) Which users do you believe benefit from a more accessible website?

	strongly agree (1)	Agree (2)	Neither Agree nor Disagree (3)	Disagree (4)	Strongly Disagree (5)
People with visual impairments benefit from an accessible website. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People with auditory impairments benefit from an accessible website. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Older users benefit from an accessible website. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People with multiple low-level impairments benefit from an accessible website. (4)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People with limited computer/Internet skills benefit from an accessible website. (5)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People with cognitive impairments benefit from an accessible website. (6)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
AI users benefit from an accessible website. (7)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We have had clients/users raise issues of website accessibility with	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

us. (8)					
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Q6.2 (Q.6.2) Which group of users do you feel would most benefit from an accessible website? Please explain if possible.

Q6.3 (Q.6.3) How does your organisation plan to meet the needs of the user group identified in 6.2 above?

Q7.1 (Q.7.1) Please answer this question if this website falls within the NTS (Federal Government website).

	strongly agree (1)	Agree (2)	Neither Agree nor Disagree (3)	Disagree (4)	Strongly Disagree (5)
The NTS has provided a necessary impetus for us to address website accessibility (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We would have achieved WCAG 2.0 compliance without the NTS. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The NTS has had little effect on our efforts to achieve WCAG 2.0 compliance. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q7.2 (Q.7.2) Please answer this question if this is a State/Territory/Local Government or government-affiliated website.

	strongly agree (1)	Agree (2)	Neither Agree nor Disagree (3)	Disagree (4)	Strongly Disagree (5)
We have been influenced by the NTS to achieve WCAG 2.0 compliance. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We have been following the NTS workplan to achieve WCAG 2.0 compliance. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The NTS has had little effect on our efforts to achieve WCAG 2.0 compliance. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q7.3 (Q.7.3) Please answer this question if this is a non-government website (Not-For-Profit or commercial)

	strongly agree (1)	Agree (2)	Neither Agree nor Disagree (3)	Disagree (4)	Strongly Disagree (5)
We have read the NTS. (1)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
We have been influenced by the NTS to achieve WCAG 2.0 compliance. (2)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The NTS has had little effect on our efforts to achieve WCAG 2.0 compliance. (3)	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Q8.1 (Q.8.1) Are you willing to be contacted by the researcher for further explanation of these responses?

- Yes (1)
- No (2)

Q8.2 (q.8.2) If yes, how would you prefer to be contacted?

- Telephone (1) _____
- Email (2) _____

Appendix 4-23 Draft of Email to participants.

In Australia, it is estimated that one in five Australians or 3.95 million people, experience long term impairment. The Australian Government Information Management Office (AGIMO) report that 2.6 million of these people with long term impairments are under the age of 65 which equates to 15% of people under the age of 65. Of these, 86% report that they experience a core limitation, which involves their mobility, communication and may restrict either their schooling or employment. (Australian Bureau of Statistics, 2010; Begbie, 2010)

In June 2010, the Australian Government released the *Web Accessibility National Transition Strategy (NTS)* (Australian Government Information Management Office (AGIMO), 2010a). This document outlines the plan for the adoption and implementation of *Web Content Accessibility Guidelines (WCAG) Version 2.0*. This plan provides a strategy for all government websites to conform to *Web Content Accessibility Guidelines Version 2.0 (WCAG 2.0)* Priority Level A by December 2012 and Australian Government sites to WCAG 2.0 Priority Level AA by December 2014.

Accessibility of all Australian websites is governed by the Australian Human Rights Commission. The *Advisory Notes* reinforce the *NTS*, but also advise all non-government website holders to ensure their websites are compliant to WCAG 2.0. New non-government websites must adhere to WCAG 2.0 AA, and existing website owners have until December 31, 2013 to comply with this same level. (Australian Human Rights Commission, 2010)

As a PhD candidate at Edith Cowan University, in Perth W.A., I am involved in research that will observe and document the transition of government and non-government websites in Australia to the Web Content Accessibility Guidelines, Version 2.0. This research will involve the following procedures:

- regular audits of publicly available websites over the term of the NTS
- surveys conducted at the beginning, middle and end of the NTS term
- development of a universal evaluation framework to assist organisations with the task of regular audits of their websites to accepted standards
- dissemination of the results of the research to interested parties

The purpose of this research is to determine whether such a mandated approach by way of a federal government strategy will accomplish the goal of achieving compliance with WCAG 2.0. In order to accomplish this research goal, a selection of websites from government websites will be assessed on a regular basis to observe their accessibility changes during the period of the *NTS*. In addition, this study will include websites from non-government sites in order to both observe their accessibility changes and also to compare these results with the government website results. An accessibility evaluation framework will be developed during the study to formalise an evaluation strategy for others to use.

As your website will be one of those examined during this auditing process (the results will be made anonymous), I would like to invite you to participate in the online survey phase focusing on your organisation's understanding of website accessibility and any processes you currently have relating to this issue.

The survey can be found here: (include URL)

If you have questions regarding any aspect of the study, please contact me at v.conway@ecu.edu.au

Yours sincerely

Vivienne Conway

PhD Candidate, Edith Cowan University

Appendix 4-24 Email from Jacqui Van Teulingen, Director, Web Policy – Accessibility, Australian Government Information Office

Hi Vivienne,

Thanks for sending me your *Website Accessibility in Australia and the National Transition Strategy: Outcomes, Findings and a Framework for Ongoing Accessibility Compliance* PhD proposal.

It will be of great benefit to have an alternate view of the government’s progress through the NTS that your PhD research proposes. Your work presents a rare opportunity for our Web Accessibility program, our endorsement of WCAG 2.0 and of course the strategy that underpins it, to be substantially tested outside of government.

Your proposed formal evaluation and examination of the accessibility of government-affiliated, not-for-profit and commercial websites provides a valuable evidence base to enable comparisons. This is something that has never been available to us before. It will also be interesting to apply the same tool and testing methodology across all websites; as you rightly note there is little literature, nor experience, in relation to testing WCAG 2.0 conformance in any jurisdiction, so your research presents another opportunity to gain valuable industry knowledge in the testing arena.

As you well appreciate, accessibility issues are not generally unique, so it will be important to maintain contact with us as your study progresses so that we may be informed about your preliminary findings in case there are issues that might be immediately addressable, either by us from a policy perspective or by government agencies.

And of course we are just three people here, so our work with the broader accessibility community is highly valuable and sharing is always welcomed.

I wish you every success.

Kinds Regards,

Jacqui van Teulingen

Director | Web Policy - Accessibility

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Department of Finance & Deregulation



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Appendix 4-25 The Australian Government's Web Accessibility National Transition Strategy

Questions posed by Ms Vivienne L. Conway, B.IT(Hons), MACS CT, AALIA(CS), PhD Candidate & Sessional Lecturer, Edith Cowan University, Perth, W.A. in order to prepare factual background for her Ph.D. thesis.

Q. What were the reasons/drivers behind the NTS?

Accessibility has been a key component of all government online strategies. Commencing in 1997 the then Prime Minister's world-leading *Investing for Growth*¹ statement committed the Commonwealth Government to deliver all appropriate services online by 2001. The government's online objectives were set out in the *Government Online Strategy*², requiring that all web resources be accessible to the widest range of people including those with disabilities, older Australians and users facing technical constraints. The strategic priority committed the government to apply the World Wide Web Consortium's (W3C) Web Content Accessibility Guideline 1.0 (*WCAG 1.0*) to all online information and services in comply with the *Disability Discrimination Act 1992 (Cth.)*. In June 2000, States and Territories also agreed to adopt *WCAG 1.0* as the common best practice standard for Australian government websites.

Commonwealth agencies reported their progress against the strategic priorities of the *Government Online Strategy* in a series of Progress reports. In December 2000, 80% of agencies reported that new websites would meet *WCAG 1.0* and outlined their methods of testing³.

Since then, the Australian Government's web environment has significantly changed in size, complexity and in the number of online services it offers. While accessibility has been a priority for a number of years, the rapid changes in the government web environment had not kept pace with accessibility standards and required a renewed focus. It became clear that *WCAG 1.0* could no longer address innovations on Australian Government websites.

¹ <http://archive.treasury.gov.au/documents/185/PDF/Full.pdf>

² http://www.finance.gov.au/agimo-archive/publications_noie/2000/04/govonline.html

³ NOIE, Government Online Progress Report, December 2000



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In April 2008, the W3C released the second version of the web standards, Web Content Accessibility Guidelines 2.0 (*WCAG 2.0*), to the candidate recommendation stage (i.e. a final draft); in response, the Australian Government Information Management Office (AGIMO) commenced a formal review of the draft *WCAG 2.0* guidelines and initiated a proof of concept project to test if *WCAG 2.0* was achievable on a sample of government websites. AGIMO submitted the *webpublishing.gov.au* and *australia.gov.au* websites as candidate case studies to the W3C for testing against the draft *WCAG 2.0* and made the [National Apology Video](#)⁴ compliant to AAA level through the addition of an Auslan translation. The proof of concept demonstrated that *WCAG 2.0* was achievable in a government context.

In August 2008, AGIMO conducted a series of roundtable discussions and education sessions with agencies to determine if the new guidelines were both appropriate and more broadly achievable across government. Guidance packs were prepared for agencies and Chief Information Officers were asked to review the *WCAG 2.0* draft and comment on its proposed endorsement. The majority of agencies responding provided consent to endorse the, then finalised, *WCAG 2.0* for Australian Government use.

In September 2009, the Secretaries ICT Governance Board (SIGB) formally endorsed *WCAG 2.0* as the standard to apply for all Australian Government Websites; mandating the implementation and adoption of *WCAG 2.0* to all government online services and information. This was further extended by the Online Communications Council (OCC) endorsement of the guideline for all State and Territory websites. Through its formal endorsement, the Australian Government set a course for improved web services, paving the way for a more accessible and usable web environment that would better engage with, and allow participation from, all people within our society.

To support the implementation AGIMO was tasked to lead and facilitate a national adoption of *WCAG 2.0*. The [Web Accessibility National Transition Strategy](#)⁵ (Strategy) was developed, primarily for Australian Government websites, to support transition to *WCAG 2.0* and as the primary document to guide the national implementation of *WCAG 2.0* in a unified, consistent and cost-effective manner. The Strategy sets out a phased work plan for transition to *WCAG 2.0* over a 4-year period; its authority is outlined on page 10 of the Strategy. The Strategy established mid and end point milestones for a progressive enhancement of the Australian Government's web environment.

⁴ <http://australia.gov.au/about-australia/our-country/our-people/apology-to-australias-indigenous-peoples>

⁵ <http://www.finance.gov.au/publications/wcag-2-implementation/>



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The Strategy contributed to Article 21 under the [Australian Government's ratification of the United Nations Convention on the Rights of Persons with Disabilities](#) (UNCRPD) and is reflected in the six strategic priorities of the [National Disability Strategy](#).

Q. Reporting under the Strategy

In drafting the Strategy considerable attention was paid to the merits of requiring agencies to report their progress. It is a well known adage that 'what gets measured gets done' and the government is no exception. There was a precedent for reporting on accessibility under the *Government Online Strategy (2000)* that was highly successful in raising awareness of accessibility issues and in encouraging agencies to apply *WCAG 1.0* to their websites.

The final *Government Online* reporting round in 2000 stated 80% of new and 29 % of existing websites had achieved *WCAG 1.0* compliance, with 56% of agencies expected to meet the standard by the end of 2000. At the time, it provided the baseline position in Australia in respect to the government's online accessibility. Since the *Government Online Strategy* in 2000, agencies had not been required to formally report on their online presence.

The [eGovernment Benefits Study](#)⁶ in 2003 collected website information from a selection of agencies with a total of 169 websites. It identified that 'useability' was a significant barrier to using government websites. It also identified that there were wider positive cost benefit ratios that flow from online service delivery, but these savings were only benefiting the people who could access the services and information. Similar findings were echoed in the PriceWaterhouseCoopers UK report [Champion for Digital Inclusion – the economic case for digital inclusion](#)⁷.

Similarly, the Web Standards Group (WSG), an independent group of web managers within and external to government conducted an [audit of government websites](#)⁸, of which one factor was conformance with WCAG standards. Their survey

⁶ <http://www.finance.gov.au/agimo-archive/ data/assets/file/0012/16032/benefits.pdf>

⁷ http://www.parliamentandinternet.org.uk/uploads/Final_report.pdf

⁸ <http://gdispain.site.net.au/standards/ag-website-audit-dec06/index.html>



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reported that only 27% of government home pages had valid HTML, and at least 23 websites failed even the basic level of accessibility; many of these were service delivery agencies.

In 2008, the [Review of the Australian Government's Use of Information and Communication Technology](#)⁹ sought data on agency websites and reported that 'citizens want government websites to be easier to find and use'. It also reported the government spent '\$80 million across 611 websites in 2007-08' and the non-published survey data indicated a further \$105 million was spent in 2008-09. The Australian National Audit Office (ANAO) had also conducted multiple audits¹⁰ focusing on the government's management of its websites and had consistently raised issues with the low level of accessibility. Its most recent report sheds light on the growing practice of agencies who believe they fulfil their accountability and functions by placing everything online in portable document format (PDF) rather than HTML, or multiple formats as recommended by the Australian Human Rights Commission.

In addition to the many and varied public reports highlighting the government's inaccessible websites, the Australian Human Rights Commission launched its 'Web Watch'¹¹ program in 2008 where we saw a number of inaccessible government websites publically named. AGIMO concluded that the inclusion of accessibility reporting as part of the Strategy would assist in addressing the public perception of the government's commitment to improving the accessibility of its web information and service.

Q. Why was this model chosen?

The Strategy is modelled on a similar approach developed for the implementation of other ICT standards within the government. It also set a three phased approach (preparation, transition and implementation) in the adoption of new technology and acquisition of technical capability and incorporated a reporting regime to ensure that agencies progress in harmony.

⁹ <http://www.finance.gov.au/publications/ICT-Review/index.html>

¹⁰ Electronic Service Delivery, including internet use, by Commonwealth Government Agencies No.18, 1999-2000; Quality Internet Services for Government Clients – Monitoring and Evaluation by Government Agencies No.30 2003-04; Government Agencies' Management of their Websites No.13 2008-09; and Online Availability of Government Entities' Documents Tabled in the Australian parliament No.37 2008-09.

¹¹ http://www.hreoc.gov.au/disability_rights/webaccess/webwatch.htm



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The Strategy also encompasses a number of enabling projects that have been led by AGIMO to provide support, education and guidance to agencies. The Strategy provided the first national government plan to endorse *WCAG 2.0* and require all government online information and services to comply within a strict, but progressive timeframe.

Q. Is the fact that there aren't clear 'enforceability' penalties etc. seen as a problem? Did you want it to be more enforceable?

Enforceability in a government context is a complex issue that is best described as a layered, self-assessed, and self-monitored approach.

Firstly the Strategy obtains its authority through the SIGB¹² which applies to agencies managed under the *Financial Management and Accountability Act 1997 (FMA Act)* and through the OCC of the Council of Australian Governments (COAG) which was comprised of communication Ministers of each State and Territory, although the OCC has now been abandoned.

The Strategy carries strict opt-out arrangements that apply to the Australian Government; no organisation has exercised this. It is ultimately the responsibility of the agency Secretary to comply with government directives. Like most organisations, agency heads must make legal statements about their application of business controls annually. To monitor the government's performance, the Auditor-General supported by the Australian National Audit Office undertakes independent assessment of selected areas of public administration, and assurance about public sector financial reporting, administration, and accountability. The government's progressive use and adoption of Information and Communication Technologies is a frequent subject of audit.

Secondly, in the case of accessibility, the *AHRC Advisory Notes explains that the Disability Discrimination Act 1992 (DDA) (Cth.)* places a legislative requirement on organisations, including the public sector, to provide goods and services to all people in ways that do not discriminate due to disability. This includes, where necessary, the requirement to make reasonable adjustments for people with disability in order to provide equal or equivalent access. For the public sector this extends to the full range of activities including policy development, procurement and service delivery.

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¹² <http://agict.gov.au/governance-awards-data/sigb>



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Third, Australia's ratification of the [United Nations Convention on the Rights of People with Disabilities](#)¹³ (UN CRPD) extends the *DDA* and makes specific reference to the fact that access to information, particularly access to government information, is considered a basic human right (Article 21). In respect to the UNCRPD Australia is accountable to the UN for its actions under the Articles. Australia will appear before the UN on 13 September 2013 and report on its progress.

In addition, Australia's [National Disability Strategy](#)¹⁴ (NDS) represents the first time in Australia that disability policy is underpinned by a whole-of-government, whole-of-life approach. Its aim is to address four strategic priorities that include: increasing the social, economic and cultural participation of people with disabilities and their families, friends and carers; introducing measures that address discrimination and human rights violations; improving disability support and services; and building in major reform to ensure the adequate financing of disability support over time. The Strategy has been included as ongoing work under the NDS and its reporting component assists the government to measure and report on its NDS achievements.

Generally breaches of Legislative requirements can attract pecuniary penalties and are administered via the relevant anti-discrimination organisations, or the United Nations in the case of appeals. AGIMO has no such remit and cannot enforce nor penalise any agency for non-conformance; rather our consistent approach is to work collegiately with agencies, States and Territories through a national *WCAG 2.0* Reference Group and a practitioners Community of Expertise to ensure they understand and commit to improving ICT accessibility as an ethical, inclusive and sustainable program of work.

Q. Do you believe that not being able to put the statement on the website to be sufficient penalty for not complying?

Assuming that you are referring to *WCAG 2.0* icons/ logos as a public statement to be applied to a website that complies with the standard, AGIMO is not advocating the application of icons/logos to websites under the strategy, although our work plan anticipates that agencies will make statements about their websites' accessibility in accordance with their action plans.

We have taken this position for several reasons, firstly the measure is necessarily binary and applies at a single point in time and experience tell us that in many cases accessibility of the site requires further explanation. We do not interpret the non-inclusion

¹³ <http://www.un.org/disabilities/default.asp?id=150>

¹⁴ <http://www.fahcsia.gov.au/our-responsibilities/disability-and-carers/program-services/government-international/national-disability-strategy>



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of a logo/ icon or statement as a penalty; however your question raises an interesting point for us that will require more detailed consideration.

Q. How are you checking the different websites' compliance - tools, self-statement, etc.?

AGIMO does not check the conformance statements or claims of agencies. AGIMO is considering conducting an independent validation program, on a sample of Australian Government websites, at the conclusion of the Strategy, post December 2014.

Following the publication of the 2012 Milestone Report we will commence development of the Strategy exit plan which will include considerations about our approach to the validation of agency reports and take account of some of the future issues as outlined in my 2011 OZeWAI presentation – [The Future and Accessibility](#).

Q. Did you take any of the other countries' policies into account when drafting the NTS, and if so which ones were most significant

There were no other federal government policies available internationally at the time our Strategy was prepared; the Australian Government was the first to formally adopt WCAG 2.0 with a specific strategy for implementation.

However, AGIMO conducted an extensive consultation program during the development of the Strategy. Consultations were conducted with

- all Australian Government ICT governance committees;
- international government jurisdictions in the United Kingdom and Canada, including the Ontario Government, and New Zealand;
- peak disability bodies in Australia including Blind Citizens Australia, Women with Disabilities Australia, as well as with the Australian Communications Consumer Action Network and disability services organisations including Vision Australia, Australian Communications Exchange Limited and Media Access Australia

Q. From AGIMO's perspective, is the model working?



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Yes, the [Web Accessibility National Transition Strategy 2010 Baseline Report](#)¹⁵ indicates good preparation by agencies and a solid base to commence transition and implementation. It also indicated that there was a lot of work required by agencies, however we are confident that they are addressing the systemic changes required in their organisations to ensure that web accessibility becomes part of their business as usual process.

AGIMO recently completed a survey of agencies reporting on their progress in relation to the 2012 milestone and preliminary analysis of the results is very encouraging. We expect to release the full report by the end of 2013.

Responses prepared in July 2013 by Ms Jacqui van Teulingen, Director Web Policy, Australian Government Information Management Office, Department of Finance and Deregulation.

¹⁵ <http://www.finance.gov.au/publications/nts-2010-baseline-report/index.html>