Faculty of Media, Society and Culture

The Disability Divide:
A Study into the Impact of Computing and Internet-related Technologies on People who are Blind or Vision Impaired

Scott Emery Hollier

This thesis is presented for the Degree of
Doctor of Philosophy
of
Curtin University of Technology

January 2007

DECLARATION

This thesis contains no material which has been accepted for the award of any other degree or diploma in any university. To the best of my knowledge and belief this thesis contains no material previously published by any other person except where due acknowledgment has been made.

_____ _____

Scott Hollier Date

ABSTRACT

People with disabilities, and in particular people who are blind or vision impaired, are not embracing computing and Internet-related technologies at the same rate as the able-bodied population. The purpose of this study was to find the reasons behind this digital divide for people with disabilities and provide solutions. The investigation into this 'disability divide' initially examined the historical significance of the social construction of disability, the developments of computing and Internet-related technologies and the evolution of associated government and corporate policies. In order to gain an understanding of the specific elements in the current disability divide, interviews were conducted with a range of government representatives, multinational information technology developers and online information providers in Australia and the United States of America. In order to gain an understanding of what people with disabilities required from information technology, a national survey was conducted with people who are blind or vision impaired to determine their computing and Internet experiences. This study clearly identified that people with vision disabilities have a high level of computing and Internet expertise and it is specific barriers, rather than lack of will, that has prevented access to computing and Internet-related technologies. These barriers include issues relating to the perception of disability in society, Federal and state government policy, corporate policy, mainstream computing products, assistive technologies, real-time online communication, poverty and a lack of educational opportunities. Addressing the issues in these areas will significantly reduce the impact of the disability divide, allowing people who are blind or vision impaired to participate more effectively in the information age.

CONTENTS

DEDICATION

This thesis is dedicated to God, my wife Ruchi, my daughter Sharlini, my parents Colin and Robyn, my sister Collene and my friends. Without your combined support, this study would not have been possible.

ACKNOWLEDGEMENTS

The following organisations, staff members and individuals have significantly contributed to the completion of this thesis.

Supervisors:

- Supervisor: Allen, Matthew (Dr)
- Co-Supervisor: Willson, Michele (Dr)
- Associate Supervisor: Murray, Iain

Organisations and Staff Members:

- Apple Corporation. *Beldon, Chris; Janes, Mary-Beth*
- Association for the Blind of Western Australia. *Crowley, Margaret (Dr); Gribble, David*
- Australian Broadcasting Corporation (ABC). *Rapley, Stephen; Parker, Cameron*
- Australian Capital territory Office of Information Technology. *Miles, Alan; Webb, Kerry*
- Australian Government Information Management Office, formerly known as the National Office of the Information Economy. *Huta, Peter*
- Blind Citizens Australia. *Diamond, Maryanne*
- British Broadcasting Corporation (BBC). *Hassell, Jonathan*
- Cisco Systems. *Gordon, Steve*
- Curtin University of Technology
- Family and Community Services, Department of.
- Freemasons of Western Australia.
- Hewlett-Packard (HP) Corporation. *Takemura, Michael*
- Humanware Corporation. *Hathaway, Ron; Hazell, Phil*
- International Business Machines (IBM) Corporation. *Basson, Sara; Steger, John*
- Internet Society of Australia. *Hill, Tony*
- Microsoft Corporation. *Moulton, Gary*
- Retina Australia (Australian Capital Territory). *Martin, Faye*

- Retina Australia (New South Wales). *Richards, Robyn*
- Retina Australia (Queensland). *Ferguson, Greaeme*
- Retina Australia (Victoria). *Giles, Kate*
- Royal Blind Society of New South Wales. *Spriggs, Rob*
- Royal Society for the Blind of South Australia. *Moir, Dennis*
- Sun Microsystems. *Beard, Marney*
- United States Government Services Administration. *Scott, Quentis*
- Western Australian Office of E-government. *Reilly, Fiona; Sales, Jenny*
- Western Australian Retinitis Pigmentosa Foundation. *French, Vivienne*

Individuals:

- Barker, Jan
- Boudville, Gigi
- Blackburn, Sue
- Capel-Bradford, Carol
- Daniel, Bob
- Ellis, Annette (MP)
- Ferris, Deanne
- Forward, Rosalind
- Green, Walter (Dr)
- Higgins, Georgie
- Higgins, Pat
- Lundy, Kate (Senator)
- Miller, Laura
- Schofield, Robyn
- Smith, Luke
- Williamson, Brad

On behalf of the people who will benefit from this research, thank you very much.

INTRODUCTION

Purpose of the study

As a legally blind individual with a computer science background, I have taken particular interest in witnessing the developments of computing and Internet-related technologies through the 1980s and 1990s. It has been an exciting process to experience and utilise the benefits of the Internet as it evolved from a 'well-kept secret' to a vital information, communication and e-commerce resource in the public realm. For people with disabilities, and in particular people who are blind and vision impaired, the arrival of mainstream computing and the Internet provides more than the sum of its parts. As well as bringing products and services, it brings hope.

The arrival of mainstream computing and assistive technology creates the potential for blind and vision impaired people to gain access to resources previously denied. The development of the personal computer, for example, meant library books could be scanned into a computer and then read aloud via a voice synthesizer. In another example, people with vision impairments could now alter the colours, fonts and other display features on a screen to improve clarity.

The Internet enabled information to be independently retrieved from anywhere in the world in a form that was often accessible to blind or vision impaired people. Online services allowed independent management of banking and the purchasing of online goods and services. Online communication meant that mobility issues associated with vision loss were no longer a disability-related restriction. Essentially, the extension of the Internet for the general population enhanced opportunities for increased independence and equality for blind or vision impaired people.

However, despite the possibilities for improved independence and equality, the information technology revolution is still largely focused on potential, rather than delivery, to people who are blind or vision impaired. Initially it may seem surprising that people in this disability group are not embracing the use of computers and the Internet at the same or greater rate as the able-bodied population. In what is deemed to be an enlightened rights-based society, most people, both able-bodied and disabled

alike, are willing to accept that the treatment of people with disabilities has improved significantly in recent decades. Yet despite these improvements, difficulties remain. People who are blind or vision impaired continue to face significant barriers in relation to poverty, unemployment and a lack of educational opportunities. As society continues to become more reliant on information technology, there is a dangerous probability that a key disability group will find it increasingly difficult to operate equitably in society. Information technology's promises may give way to a compounding of existing difficulties. This 'disability divide', a term I use in this thesis, describes the gap between the able-bodied population and people with disabilities in gaining access to computing and Internet-related technologies.

Although the issue of the disability divide revolves around the importance of access to computing and Internet-related products and services, it is not based on information technology alone. As Barton (1996, p14) states, modern disability is, in itself, "…an exploration of issues of power, social justice, citizenship and human rights." The perception of disability in the community, along with the provision of resources, corporate motivations and government policies, all contribute to the ways in which people who are blind and vision impaired might gain access to computing technologies. Given that a rights-based society is meant to effectively support people with disabilities, the purpose of this study is to ask if society's treatment of people with disabilities is effective in addressing the disability divide, and which elements can be improved to significantly reduce the impact of the disability divide. Essentially, this thesis investigates how these social and technological factors entwine to create the disability divide and how such factors impact on people with vision disabilities.

Research questions

The research questions for this study are as follows:

- How do people with vision disabilities perceive themselves and society, and how does this affect access to computing and Internet-related technologies?
- Are computing and Internet-related technologies beneficial to people with vision disabilities?

- Are computing and Internet-related technologies providing effective for people with vision disabilities?
- In what way do government policies, online information provides and information technology corporations affect the disability divide?
- How can issues related to the disability divide be resolved?

Aims and objectives

This study investigates the ways in which the Internet, while promising much assistance to many people who are blind or vision impaired, has become yet another arena in which disability leads to inequalities in society. In the course of the investigation, this study has sought to discover the ways in which this digital divide for people with vision disabilities, referred to as the disability divide, can be bridged. The specific research objectives were:

1. To demonstrate the ways in which Internet technologies provide advantages for people with vision disabilities;
2. To develop a clear understanding of the ways in which people with vision disabilities perceive and utilise Internet technologies in relation to self, establishing the extent and nature of perceived barriers or benefits;
3. To investigate and determine the effectiveness of Internet-related products and services available to assist people with vision disabilities;
4. To determine the effect of government policy and corporate initiatives on the issues surrounding the disability divide; and
5. To propose solutions that will help close the disability divide in relation to Internet use and access between people with and without a disability.

Significance of the study

This study is significant for the following reasons:

1. This study will contribute to society by finding ways to narrow the disability divide gap, potentially preventing a disability divide crisis in Australia.
2. A greater understanding of the factors that contribute to the disability divide will be revealed, allowing for disability divide-related issues to be easily identified in government and corporate realms.

3. Issues pertaining to the provision of computing and Internet-related technologies amongst people who are blind and vision impaired can be identified, providing opportunities to resolve IT-related issues.
4. Other difficulties faced by people who are blind or vision impaired, such as unemployment and a lack of educational opportunities, can be addressed through identifying and resolving disability divide-related issues.

Background to the study

The Internet, a term formally adopted in 1995 to describe the development of a vast computing network, began as a military research project within the United States four decades ago (Leiner et al., 2002). Although the interface was crude by today's standards, the network expanded rapidly into educational institutions and then gradually into the public realm. Subsequently, the primary interface of the Internet became graphically oriented through the World Wide Web and the number of people using this technology grew rapidly around the world (Leiner et al., 2002).

Despite these initial developments in the public realm, the Internet did not correctly address the accessibility requirements of people with disabilities. The 'digital divide', a term coined by the US government in the mid-1990s, addressed the growing gap between "…those who had access to the Internet and those who had not" (World Wide Words, 1996). One of the groups identified in the original analysis of the digital divide were individuals with disabilities and in particular, people with vision disabilities.

It is, however, impossible to consider issues of Internet and disability without examining the perception of disability in our society. Until the 1950s at the international level, most countries did not have a clearly defined policy for assisting people with disabilities. In the United Kingdom, for example, people were either discouraged or not actively encouraged to enter the workforce. In 1958, the British government realised the potential economic benefits in having people with disabilities in the workforce. As a result, sheltered workshops were introduced and shared accommodation was encouraged (Schlesinger & Whelan, 1979). Other

countries, including Australia, implemented similar policies shortly after the British government initiative.

Throughout the 1960s and 1970s, studies were undertaken to assess the effectiveness of such government policy in relation to people with disabilities. One such study revealed that the government had succeeded in providing economic benefits to the country, but noted that "...the majority of those attending the Centres will probably work there permanently because they will never reach outside employment" (Schlesinger & Whelan, 1979). Although supporters of the existing government policy guidelines wanted to continue with the existing policy on economic grounds, it was widely acknowledged that the results of studies into the sheltered workshops were alarming and not in the best interests of people with disabilities in either the private or public sector. The governments involved acknowledged the problem but stated that new policies were difficult to implement as there was no clear definition of disability from which to create new appropriate legislative measures. One critic stated that "in Britain, no attempt has been made to respond systematically to the problems of the disabled population" (Sainsbury, 1973, p. 12).

Due to the emerging global focus on the needs of people with disabilities together with the desire for clear definitions on the issue, the World Health Organization (WHO) formally released a series of guidelines to the International community in 1980. These guidelines were significant as they provided unparalleled clear definitions for the terms 'impairment', 'handicap' and 'disability' (Richards, 1982). Although the specifics of these definitions have been, and continue to be constantly debated and redefined, government bodies around the world adopted the WHO recommendations. This acceptance directly challenged existing philosophies and created a focus on deinstitutionalisation policies. Australia implemented many of the values and concerns expressed in the WHO definitions through the creation of the Disability Services Act of 1986 (Baume & Kay, 1995).

During this period of legislative and social changes, another significant transformation was occurring that would also have a fundamental impact on people with disabilities. The computing revolution was beginning to increasingly affect

many people's daily working and family lives. With the first commercially available home computer entering the market in 1975 and the introduction of more traditional personal computers in 1977, the late 1970s and 1980s saw a vast and progressive change in the acceptance of new technology (Carlson, Burgess, & Miller, 1996). Although tens of millions of people used computers through the 1980s, very little attention was paid to making this new technology accessible to people with disabilities. Ensuring new hardware and software could be used by a majority of the population received precedence over assisting people with disabilities to 'keep up' with the revolution. As such, many industry leaders did not cater for people with disabilities during this time. For example, Microsoft Corporation, the world's biggest software manufacturer, did not embark on their first accessibility computing project until 1988 and did not employ their first full-time accessibility staff member until 1992 (Microsoft, 2002).

Through the late 1980s and the 1990s, it became apparent that computing technologies were becoming such an integral part of daily life that it was vital for computers to be accessible to all people, including those with disabilities. The momentum from many advocacy groups, in conjunction with the promotion of educational and legal resources led to the creation in the US *Americans with Disabilities Act* (ADA) of 1990 (U.S. Department of Justice, 2002). This legislation was designed to legally enforce equality in all environments, including computing technologies.

The introduction of the ADA led to the incorporation of accessibility features in the development of major computing operating systems throughout the early 1990s. The momentum of these developments launched a variety of accessibility initiatives in markets such as Australia. Examples of these initiatives include products such as JAWS and ZoomText which were designed specifically for people who are blind or partially-sighted (Walker, 2002).

The rapid arrival of the Internet into the public realm changed the perceived importance of computing. Initially it was considered, at best, a corporate tool or entertainment package and, at worst, a novelty. However the Internet added a vital information and communication resource to personal computers. In later years, the development of the graphical interface, provided a more accessible computing

environment for a majority of users, but ironically left the Internet more inaccessible to some disability groups. The widening gap between people who were able to access this new technology in comparison to groups in society who were unable to access the technology became known as the digital divide (World Wide Words, 1996).

In 1999, the World Wide Web Consortium (W3C) released a series of guidelines that attempted to make the World Wide Web, the most common interface to Internet information, accessible to people with disabilities and in particular, people with vision disabilities (W3C, 1999). Although the guidelines were a significant step forward in creating an accessible Internet environment, it became common for these guidelines to be ignored due to time constraints or in an effort to make a web site more aesthetically pleasing (Williamson, Albrecht, Schauder, & Bow, 2001).

Accessibility aside, there are other reasons for a reluctance to access the Internet. For example, a recent study in the United States of America (USA) revealed that approximately 33% of the population had chosen not to go online due to a perceived lack of need, lack of computer, lack of interest or lack of knowledge (Digital Divide Network, 2002). However, this figure is significantly lower than people with disabilities in which approximately 60 percent have never used a computer, let alone the Internet (National Telecommunications and Information Administration, 2000). Although this information is significant in itself, this study fails to put forward any hypothesis as to the reasons behind the higher rate of the digital divide for people with disabilities. On this basis, it is important to investigate the perception of an individual with a disability and associated factors to determine why people with disabilities are not embracing computing and Internet-related technologies as rapidly as the able-bodied population.

Overview of the thesis

Chapter 1, *The social and historical context of disability*, explores the current perception of disability by positioning such perceptions according to their social and historical context. The social construction of disability, and its impact on the

creation of policy, is vital to this thesis in demonstrating how the views of society affect the welfare of people with disabilities.

Chapter 2, *The role of computing and Internet-related technologies for people who are blind or vision impaired*, demonstrates the help and hindrance that computing, the Internet and associated assistive technology products. This chapter contributes to the thesis by identifying the role of computing and Internet-related technologies in providing assistance to people who are blind or vision impaired.

Chapter 3, *Elements of the disability divide*, demonstrates how the social construction of disability, the creation of associated policy and the barriers of computing and Internet-related technologies have contributed to the current disability divide. This chapter identifies the key elements of the disability divide and the significance of the reoccurring disability divide phenomenon.

Chapter 4, *Disability-specific policy and legislation*, identifies specific policy and legislation which affects the disability divide. This chapter identifies through personal interviews conducted with key members of the state and Federal governments, the key policies that affect the disability divide in Australia and how changes in policy, or the creation of new policy, could significantly impact on the disability divide issues.

Chapter 5, *The provision of online information*, explores how online information is currently provided by government and the media to people who are blind or vision impaired. This chapter determines the effectiveness of current disability and information technology-based legislation and the views of significant individuals involved in the policy and legislation decision-making process.

Chapter 6, *The provision of operating systems, software applications and hardware*, examines corporate policy and the impact that large multinational corporations and assistive technology products have in the provision of accessible computing and Internet-related technologies. Through the use of personal interviews with key multinational corporations, this chapter identifies a number of policy and product issues that have an influence on the disability divide.

Chapter 7, *Survey methodology and findings*, discusses the national survey of blind and vision impaired people, designed to find out what people who are blind or vision impaired require from computing and Internet-related technologies. This chapter examines the survey design, survey distribution, the response to the survey and other methods used to gather the data.

Chapter 8, *Analysis of findings*, examines the survey results in detail and identifies the relationship between the computing and Internet experience of people with vision disabilities and the disability divide. This chapter goes to heart of identifying key disability divide issues, their relationship with social and technological barriers and how such barriers can be resolved.

1.0 THE SOCIAL AND HISTORICAL CONTEXT OF DISABILITY

1.1 Introduction

This chapter focuses on the historical development of the concept of disability. Since the 1970s, society has made significant progress towards achieving equity between people with disabilities and the able-bodied population. However, despite such progress, many people continue to struggle with issues of poverty, unemployment and a lack of educational opportunities. Such issues continue to extend far and beyond that experienced by their able-bodied counterparts.

The fact that disability is a fluid, ever-changing concept demonstrates that perception plays an important role in the creation of policy and ultimately the development of disability-related tools and resources. It is therefore necessary to understand disability within its past and present context when exploring and researching areas relating to the treatment of people with disabilities. For people who are blind or vision impaired, there is an additional difficulty. In addition to specific mobility and learning difficulties, there is a general perception of fear associated with blindness which contributes to the increased difficulties of this group.

This chapter contributes to this research by identifying the current role of disability in society, and **demonstrates** how the current role has evolved from changing social categories. In addition, this chapter explores the interrelationship between the social construction of disability and the creation of policy with an emphasis on people who are blind or vision impaired.

1.2 Disability today

A permanent disability, as viewed by the Australian Bureau of Statistics (2003a), is an impairment that is likely to last, or has lasted, in excess of six months. In Australia, approximately four million people, or 20% of the population, have some

form of permanent disability and this percentage has steadily increased in recent years (Australian Bureau of Statistics, 2003a). Other Western countries have a similar situation. In the United States of America (USA), approximately 19% of the population have some form of permanent disability (United States Census Bureau, 2000) and in the European Union (EU), approximately one in six people of working age have some form of permanent disability (European Agency for Safety and Health at Work, 2002). The prevalence of disability is not only of concern for Western governments but also a highly important global issue. According to the World Health Organization (WHO), there are approximately 600 million people in the world with some form of disability, approximately 10% of the world's population.

Initially, it would seem that the statistics suggest Western cultures have a substantially higher rate of people with disabilities in comparison to the world average. Whilst it is possible that factors such as a longer life expectancy has increased the disability rates in Western countries, it remains difficult to establish this as fact. Despite the importance of being able to view statistically disability-related issues on a global scale, there is surprisingly little data to allow for a statistical comparison between different countries. This situation is due to different measuring standards including age groupings, the selection of disabilities to be used in the statistics, the impact of the aging population in an overall statistical analysis and the time period in which a disability is defined as permanent. To address these irregularities, the United Nations Statistics Division initiated a system in 2005 that will provide a systematic and regular collection of basic statistics on human functioning and disability (United Nations Statistics Division, 2004).

However, statistical anomalies between countries do not hide the significance and prevalence of people with disabilities in both global and local terms. Even such limited statistical information demonstrates the sheer number of people affected by disability. It also demonstrates disability-related problems such as unemployment and exclusion from education and poverty. It is estimated that approximately 80% of people with disabilities live in poverty and find it difficult to meet their needs for food, shelter and rehabilitation (World Health Organization, 2004). Such data emphasise that people with disabilities are some of the most disadvantaged in

society. Although it is difficult to implement a global data analysis of disability, virtually all reports on disability welfare acknowledge that there is a clear linkage between poverty and disability (World Bank Group, 2004). The impact of poverty is twofold: currently, poverty can cause disability through, for example, poor health care and secondly, a person with a disability is more likely to struggle with poverty since, without support and assistance, the individual is prevented from leading a productive life (World Bank Group, 2004).

In Australia, issues of educational disadvantage, unemployment and poverty are equally relevant. In terms of education, approximately 30% of people with disabilities aged between 15 and 64 have completed schooling to Year 12 and 13% have completed a bachelor degree or higher. This is notably different to the total population whose educational rates are 49% and 20% respectively. In terms of employment, there are again significant differences. People with disabilities achieve an employment rate of 53% and have an unemployment rate of 8.6%, as opposed to 81% and 5% respectively for the able-bodied population. Personal income for people with disabilities on average is approximately half that for an able-bodied income earner. People with disabilities are further disadvantaged in that the removal of one or more essential life skills can dramatically reduce the opportunities for education and employment (Australian Bureau of Statistics, 2003a). The connection of disability with unemployment **AND** a lack of education and poverty were highlighted in a Senate committee into poverty in Australia. It was noted that poverty was particularly prevalent in Australia amongst people with disabilities due to "…a combination of factors including low incomes, fewer employment opportunities or additional costs due to their disability" (Australian Federal Government, 2002).

These statistical data regarding people with disabilities provide an important overview of the welfare of people with disabilities. However, facts and figures reveal only a snapshot of current conditions and do not explain how people with disabilities experience their disadvantage in our society. In order to explore this issue, it is necessary to understand the way society perceived, and currently perceives, people with disabilities. It is also important to understand the way in

which people with disabilities perceived, and currently perceive, themselves. It is to this question of social perception that I now turn.

1.3 The social construction of disability

Such an exploration is needed because there is a distinct separation between the way in which disability is perceived and the effects of the disability itself. Throughout history the presence of people in society with disabilities has remained constant, yet the treatment of people with disabilities has changed (Deutsch & Nussbaum, 2000). It is not disability as such but, rather, the social construct of disability that has defined how a disabled individual lives and functions within a social framework. It is therefore necessary to explore, briefly, the historical construction of disability in society in order to gain an understanding of how people with disabilities are currently treated. Disability as a social construct encompasses both the literal knowledge of limitations caused by a disability and how a person with a disability is perceived by society as a result of the disability. The social categorisation of disability is the mainstream view of disability during a particular time period within a particular society. This categorisation changes over time, with broader societal changes often providing a catalyst for change in how people with disabilities are perceived.

Prior to the eighteenth century, the issue of people with disabilities was rarely documented, for it was not believed to be a significant issue in its own right. Disabilities at this time were either not noted or were mentioned simply as one of many physical traits of an individual. For example, in the seventeenth century, King James I was noted as having a tongue larger than his mouth and weak legs but this was only remarked on as part of his overall characteristics. Furthermore, the presence of these disabilities was not deemed to be significant in any way to the role of the king (Deutsch & Nussbaum, 2000). During the initial period of the Industrial Revolution, disability issues became more apparent, in part because of industry-related injuries which increased the prevalence of disabilities (Deutsch & Nussbaum, 2000). As the number of disabilities increased throughout the nineteenth and twentieth centuries, perceptions of disability became more distinct from the perception of people generally.

In broad terms, there have been four significant ways in which disability has been categorised and constructed in Western societies in the past three centuries, all of which still play a role in contemporary thinking. These categorisations can be thought of as a series of 'models' within which individual people with disabilities are collected and then treated according the internal logic of that model. The models are:

- the charity model
- the medical model
- the rights-based model and
- the economic model.

Each model represents a majority view of how society reacts to people with disabilities. While a particular model may be dominant, other models are also likely to be present in society as minority viewpoints.

The first way in which society has collectively viewed people with disabilities is commonly referred to as the charity model. The charity model, categorising people with disabilities as in need of charity, is based on the definition that a disability is "a tragedy, or a loss" (Coloridge, 1993). Fulcher (1989) suggested that the charity model depicts people with disabilities as those needing help, objects of pity, personally tragic, dependent, eternal children and low achievers by ideal standards. In the charity model, people with disabilities are positioned as unalterably different; people with disabilities are thought incapable of becoming financially self-sufficient and therefore need support from the able-bodied population. The dominance of the charity model as a social category emerged in the nineteenth century (Deutsch & Nussbaum, 2000). As a result, the able-bodied population perceived people with disabilities as significantly devalued and people with disabilities also believed that they were incapable of achievement. This led to people with disabilities relying more on the support of charities. People with disabilities often identified the able-bodied population with a sense of freedom and independence beyond their grasp. The way that the charity model worked can be observed through the advertisements used by the United Way shortly after its founding in the USA in 1887. The terminology generally used by the charity consisted of words such as 'spastic', 'handicapped', 'retarded' and 'cripple', with posters showing images of people with disabilities in a position of life-long

dependence (J. Wilson & Wilson, 2001). The use of such language and imagery reinforced the idea of disability as being a tragedy, a loss or somehow self-induced and it led to donations which provided financial support.

In the early to mid-twentieth century a new model emerged to guide the general social construction of disability, based on advances in medical practice. This medical model focused purely on how a person with a disability compared to what might be perceived as a 'normal' individual (Coloridge, 1993). As noted by Price and Shildrick (2002), the medical model shifted the focus away from the charity model's moral implications of disability, redefining disability as a failure of the body. This approach allowed for a distinction between a person with a disability and an able-bodied individual. This approach allowed disability to be treated scientifically instead of being the subject of purely emotional responses.

As society shifted towards medically based interpretations of disability, many changes also occurred in relation to the interaction of people with disabilities in society. The emphasis on a person with a disability being physically inferior to an able-bodied individual resulted in many people being prevented from entering the workforce in Western countries. In Britain, for example, people with disabilities were either discouraged or not actively encouraged to enter the workforce until 1958 (Schlesinger & Whelan, 1979). The medical model ultimately puts forward the social argument that if the body can achieve physical independence, all other components of an individual's life will achieve the same independence (J. Wilson & Wilson, 2001). The advantage of this perception is the removal of potentially damaging negative connotations associated with emotional trauma or the perception of loss. The disadvantage, however, is that the labelling of an individual based on how different they are to a 'normal' body emphasises their exclusion from the able-bodied population (Fulcher, 1989).

In the mid 1970s, a new model, based on the rights of people with disabilities to have equitable treatment in society, began to emerge. This rights-based model came to prominence in part due to the number of people in the United States of America with disabilities resulting from the Vietnam War and in part due to the increased activity of human and civil rights movements at the time (Clear, 2000).

The rights-based model was ultimately committed to extending full citizenship to all people regardless of potentially discriminating elements which included disability (Fulcher, 1989). In this model, people with disabilities were not just held to be capable of effective interaction with the rest of society but it was assumed that any impairment resulting from an individual's disability should no longer have meaning in the pursuit of equity and independence (Parsons, 1994). This model differed from the charity and medical models in that it did not perceive a need for sympathy towards people with disability, nor did it acknowledge that a difference in body should affect the capability of an individual. The rights-based model instead focused on the responsibility of society to resolve difficulties faced by people with disabilities within the facilities provided to the able-bodied population.

Although the rights-based model still acknowledged that there is a difference between people with disabilities and the able-bodied population, the model suggested that effective integration of these differences into society could remove barriers on physical, environmental and societal levels. Shakespeare (1975, p41) stated that "neither information alone nor contact with the disabled…are sufficient in themselves to change attitudes but that the effect of these combined has a favourable impact." Such a statement reinforced the fact that, within the rights-based model, difference could be understood, accepted and compensation provided, without constituting people with disabilities as lacking essential humanity.

In recent times, disability has also come to be constructed in a manner that is best termed the economic model, based on the idea that people with disabilities, as with the able-bodied population, can be understood as consumers who, by buying goods and services, stimulate a nation's economic growth. As previously discussed, approximately 20% of the Australian population has some form of permanent disability. The provision of products to such a large percentage of the population has the potential to be highly beneficial to people with disabilities and highly profitable to corporations providing the necessary goods and services. In particular, people with disabilities often have special needs for products and services to support their independence. The provision of both modified mainstream products and disability-specific products can be seen as mutually advantageous to both people with disabilities and the corporations which are providing the products and services. The

economic model complements the rights-based model, and within it, people with disabilities are construed to be capable of achieving economic equality with the able-bodied population and in turn being served by a free-market economy in the supply of products catering for the needs of people with disabilities. In this economic model, partial responsibility for the assistance of people with disabilities passes from the state to the broader society in which people with disabilities live.

One early manifestation of the kind of approach to disability which can be construed as 'economic' came in the 1950s when the British government realized the potential economic benefits of having people with disabilities enter the workforce after the World War II. As a result, sheltered workshops were established in Britain and other countries including Australia (Schlesinger & Whelan, 1979). This model has gained significant popularity in recent times. Now, it can be asserted, profiting from people with disabilities is not seen as a detested act of greed but is understood, at least in part, as a mutually beneficial arrangement.

In essence, the social construction of disability is significant in demonstrating how the views of society have changed and continue to evolve. The different categorisations, represented as models, demonstrate the changes in dominant thinking. The perception of disability as explained by the charity model's emphasis on tragedy and loss creates a different perspective from the medical model-based perception that disability represents an inferior aspect of the body. The rights-based and economic models provide different aspects again, affecting the perception of disability rights and the pursuit of mutual economic benefits respectively. Yet such viewpoints are merely a catalyst for change, rather than the change itself. The dominant social category often becomes the foundation for creating policy and can have a direct impact on the differing policy approaches for people with disabilities.

1.4 Policy approaches for people with disabilities

The models within which society as a whole views and constructs people with disabilities are, by themselves, largely without particular force or effect in the everyday lives of such people. However, these models have, and continue, to underpin the development of policy which in turn takes real substance in legislation

that affects the interactions of people with disabilities and the rest of society. Policy and legislation, therefore, give effect to the models just described and in turn reinforce or change their dominance in society.

Bourk (2000) likens policy making to a cultural evolution, in that the dynamic nature of a culture results in the creation of policy that grows or evolves. This indicates the close relationship between the views of society and the formation of policy; should policy not reflect the views of society, it becomes culturally redundant. In essence, policy cannot stand still because the views in society on which policy is based cannot stand still.

In terms of disability-specific policy, there is also a close relationship between the changing social categories and the rapidly changing ideological, theological and cultural factors considered in the formation of legislative frameworks. Drake (1999) identified five such ideological categories for creating policy and legislation for people with disabilities. These ideological stances are as follows: negative, laissez-faire, piecemeal, maximal and social rights-based.

The negative ideological stance involves actions by the state that actively deny the civil rights of people with disabilities. A link can be seen with the charity model, in which people with disabilities are to be pitied and are believed to require assistance, precisely because they are *not like* other 'normal' people. Viewing people in terms of their tragic circumstances, as with the charity model, places individuals in a situation where they are always seen in a negative context and denied the right to live independently within society. As a result, negative policies are most likely to be adopted during a time when the charity model dominates social constructions of disability. In large measure, policies in the contemporary era are not characterised by a negative ideology.

The laissez-faire ideological stance focuses on absenting the state from intervention in social order so as to better meet the needs of people with disabilities. This stance is closely tied to the emerging free-market economic model, where the market rather than government determines the way in which society caters for people with disabilities. Although it is rare for the state to be completely removed from the

role of people with disabilities, governments that actively encourage private industry to cater for people with disabilities can lead to the economic model becoming dominant, both implementing laissez-faire-based polices and further reinforcing this ideological stance. For example, the Canadian Federal government used this stance in the mid-1990s by actively campaigning for private industry to employ people with disabilities. Although this approach initially involved significant involvement from the government, it resulted in a reduction of disability-related government services due to the increased support of the corporate sector (Canadian Department of Human Resources and Skills Development, 1999). Similar developments are currently taking place in Australia with changes to welfare provisions for people with disabilities (Lane, 2000).

The piecemeal or disorganised ideological stance occurs when the state takes some responsibility, but in an ad-hoc or hazardous way. This model is associated more with a changing of social categories rather than a specific social category. Changing social constructions of disability - for example the increased recognition of the rights of people with disabilities - effectively place governments in a position where they must develop and implement new policies. This policy development can often occur in an uncoordinated manner as several different perspectives on what is best to be done for people with disabilities come into conflict; from such incoordination, hazards can result for people with disabilities, particularly where insufficient time and research has been devoted to formulating effective policies to assist such people and the changes are, instead, carried through in a shallow and speedy response to apparent changes in social need. Essentially, such policy developments reflect the state's lack of consistent engagement with people with disabilities. While this ideological stance rests on the assumption of state responsibility for people with disabilities, it also reflects the very low priority accorded to this responsibility

Maximal policy endeavours to actively identify and resolve disadvantages caused by an individual's disability but with minimal consultation. It is strongly centred on the role of the state but in a relationship that silences the voices of people with disabilities in favour of the implementation of policy developments based on scientific or medical advice. Maximal policy is therefore closely linked to the

medical model in that it constructs people with disabilities as inferior individuals who need to be cared for by the government in safe environments such as sheltered workshops without actually treating such people as capable of full independence. Thus, while reflecting greater care, a maximal policy ideology serves to severely limit the potential for independence by removing rights from the individual and giving them to the state to ensure that they are seen to be productive members of society (Drake, 1999).

In Western culture, specific policies and practice differ between countries. However, they are largely based on a social rights-based ideology in which the state views its responsibility to assist all citizens, including people with disabilities, and takes special care for those whose rights might be threatened or challenged by differences from perceived 'norms'. This policy stance reflects the rights model previously discussed; it is designed to ensure equal support to all groups and supports the independence of people with disabilities which can result from such policy. The potential detriment of such a policy for people with disabilities is that "…disablement is a product of society and environment designed by non-disabled people for non-disabled people" (Drake, 1999, p36). Although policy directions such as this are highly beneficial to people with disabilities, governments must constantly endeavour to anticipate and meet the needs of people with disabilities to ensure equality in society.

In essence, the decision-making process regarding disability-related policy and legislation is largely based on the social construction of disability. The different social categories, viewed as models, are closely related to the different ideological stances used in the development of policy. As society changes, the ideology behind policy creation also changes.

1.5 Examples of disability-related policy and legislation development in western countries

As previously demonstrated, the way society views people with disabilities is, in a general sense, constructed by the internal logic and assumptions of 'models' of disability, one of which tends to be dominant in a particular society at a particular

time. Policy and resulting legislation flows from that model, giving effect to one or other particular ideological stance that determines the overall relationship of the state to people with disabilities. Each of the ideological stances outlined tends to reflect one of the models.

An example of the relationship between policy and models was demonstrated in the 1950s when most Western countries did not have any clearly defined policy for people with disabilities. Sainsbury (1973, p12) indicated that "in Britain, no attempt has been made to respond systematically to the problems of the disabled population." The reason for this lack of policy was due to a combination of piecemeal and negative policy approaches in that the government did not have any active policy and it was seen to be the role of charities to look after people with disabilities, reinforcing the association of disability with tragedy and loss.

The effective implementation of maximal policy occurred in the late 1960s and early 1970s, while rights-based policies and legislation began to emerge in the mid-1970s in most Western countries (Clear, 2000). An example which highlights the use of maximal policy and the move towards the use of rights-based policies was the introduction of sheltered workshops in Britain (Schlesinger & Whelan, 1979). The introduction of sheltered workshops by the government ensured a high level of government intervention in the lives of people with disabilities. However, a change in policy was sparked by a number of studies. One significant example is the 1979 British study into the validity of sheltered workshops. Although this study revealed that the government had succeeded in providing economic benefits to the country through the use of laissez-faire and maximal-based policies, the report noted that "the majority of those attending the Centres will probably work there permanently because they will never reach outside employment" (Schlesinger & Whelan, 1979, p104). This was a large blow to existing policy as it was initially believed that getting people with disabilities into sheltered workshops was a valid and responsible way of social integration.

Further study into the sheltered workshops concept identified inconsistencies in government policy. As a result, disability advocacy groups sought to abolish this approach and implement clearly established guidelines for the physical and economic

independence of people with disabilities. It was hoped that a rights-based approach would lead to a better understanding of people with disabilities by the able-bodied population (Sainsbury, 1973). Stubbins (1977, p295) represented the views of many social commentators during this period, stating: "...it is scarcely possible to overemphasize that the disabled must be understood as a human being serving as a background to the study of disability."

Disability advocacy groups and ongoing research raised awareness among the creators of policy that the issues of disability required concise, uniform policy. As a consequence, many Western governments, including Australia, wanted to move away from the unclear policies, which were based largely on maximal ideologies, to formulate new rights-based policies. The main difficulty was that there was no clear guidance as to how to build a defining framework for these policies. In the past, policies had been based on definitions relating to human behaviour, developmental psychology, social psychology and differential psychology. In order to provide rights-based policies and legislation, new definitions were required (Stubbins, 1977). The implementation of policy, initially designed to reflect societal change, in turn, promoted more changes to occur. Everyday language for addressing people with disabilities - terms such as 'spastic', which was once a clearly defined medical term - was now deemed to be offensive (Lansdown, 1980). Even the term 'the disabled' was considered unjust as it depersonalised individuals and their particular requirements (Sutherland, 1981). There was also growing interest in and access to disability information, which led to a greater focus on different types of disabilities at educational institutions. This focus was made possible as funding became more readily available.

The 1980s was a time of substantial change in disability-related legislation, affecting both the implementation of disability support programs and public education. In the mid 1980s, disability support programmes were introduced into mainstream schools in Australia. The general public also had increased access to and developed a greater understanding of disability issues. At the same time, legislation in Australia and other similar Western societies changed the legal requirements of deinstitutionalisation and reintegration policies. As the importance of disability-related rights were recognised and the economic outlook for Western governments

improved, funds were now available to implement any changes that would be required as a result of implementing new policies.

In Australia, the implementation of disability-related polices and legislation was an important step in improving the lives of people with disabilities. However, the implementation of such policies was sluggish in many key areas such as employment and education. An example of piecemeal policy was highlighted by a report commissioned for the examination of disability service issues within the TAFE system which examined the support available to students with disabilities. The report indicated that within the tertiary educational environment, "…resources are very thinly spread, programs are overly dependent on the individual efforts of some teachers… job support and placement are poorly developed, funding is unreliable, inadequate and not sufficiently focused" (Australian Department of Community Services and Health, 1988, p40).

Currently, as previously indicated, policy in Western culture is generally rights-based. However, within specific policies there are differences in which some aspects are based on other ideologies. Lunt (1994) examined the differences in legislation within the EU, the USA, Sweden, and Australia and confirmed the above. One example of differing policies is in the area of employment. The study indicated that while countries such as Australia and the USA generally favour supportive employment in preference to sheltered workshops, other countries still have sheltered workshops as part of an overall disability strategy. Like views in society, this report demonstrates that policy approaches can vary depending on the ideologies of those involved in the decision-making process.

Overall, the development of policy and legislation for people with disabilities has evolved through differing policy ideologies based on the changing social categories of disability. The dominance of the charity model was reflected by the initial dominance of negative-based disability policy. This situation gradually changed into maximal and laissez-faire based policy models in conjunction with piecemeal policy approaches. The implementation of more formal right-based legislation in the 1980s reflected the dominant social category and in turn enforced the provision of support to people with disabilities.

1.6 The evolution of the International Classification of Impairment, Disability and Handicap

One of the most significant contributions to rights-based disability policy and legislation was the development of the International Classification of Impairment, Disability and Handicap (ICIDH). The current dominance of rights-based policy and legislation depended, and continues to depend greatly, on a clear system of disability terminology. Western governments have acknowledged that, in relation to legislation, "the importance of definitions has become greater as access to significant services depends upon such definitions" (Thomas, 1982, p20). The framework which provides the definitions used in most worldwide disability-related policy are the definitions created by the World Health Organization (WHO).

World attention towards the needs of both people with disabilities and policies regarding people with disabilities was attracted by the WHO in 1976 when it released a preliminary set of key definitions of disability terminology. These definitions were refined and formally released to the international community in 1980.

> IMPAIRMENT: In the context of health experience, an impairment is any loss or abnormality of psychological, physiological or anatomical structure or function.
>
> DISABILITY: In the context of health experience, a disability is any restriction or lack (resulting from an impairment) of ability to perform activity in the manner or within the range considered normal for a human being.
>
> HANDICAP: In the context of health experience, a handicap is a disadvantage for a given individual, resulting from an impairment or a disability, that limits or prevents the fulfilment of a role that is normal (depending on age, sex, and social and cultural factors) for that individual. (Richards, 1982)

Impairment refers to a psychological or physiological condition; disability is a restriction as a result of that condition and a handicap is a restriction placed on an individual by society. These definitions were promoted by the WHO as part of the

United Nations (UN) during the International Year of Disabled Persons in 1981. The establishment of these definitions provided a welcome resolution to the issue of terminology and they became the basis for disability-related legislative policy throughout the world.

The creation of these definitions and the 1981 International Year of Disabled Persons increased the profile of people with disabilities and pressured governments to be more vigilant in the provision of disability-related services. In Australia, for example, there was no comprehensive, reliable information about people with disabilities until 1981 when the Australian Bureau of Statistics carried out a national census and survey on disability-related issues (Australian Science and Technology Council. Technological Change Committee, 1984). This study provided the first real insight into the difficulties faced by people with disabilities in Australia, including poverty, education and employment. Although increased awareness at this time led to improvements in the areas of employment, education and social interaction, people with disabilities were still faced with "...diminished opportunity for participation in the kind of life opened to those who are not disabled" (Richards, 1982, p3). One of the main reasons for this situation was the worldwide economic recession which prevented governments from spending money on the creation of new disability-related resources. In the United States, for example, people with disabilities were not deemed to be an urgent priority in comparison to the more pressing needs of the able-bodied population (Coudroglou & Poole, 1984).

Despite a decrease in the development of disability-related policies, the WHO continued to lobby for improved policy and legislation. The creation of the ICIDH further demonstrated the relationship between the formation of views in society and the relationship between those views with the formation of policy and legislation. Such definitions were necessary to form a basis for new policies, moving away from the previous piecemeal and maximal policy approaches.

However, the WHO definitions, although now implemented in numerous pieces of legislation throughout the world, continue to be refined. Many in the sociology and psychology professions were highly critical of the initial WHO definitions. Many thought the definitions were too simplistic and inhibited their

ability to define, discover, report, and measure the concept of disability (Coudroglou & Poole, 1984). Others believed that a professional body such as the WHO should have gone further in supporting professionals in the field and should have taken a more proactive role in addressing the welfare of people with disabilities.

This criticism has resulted in the WHO keeping the definitions under constant review. Throughout the 1980s and 1990s, the WHO definitions continued to undergo minor changes. In recent times, however, these definitions have undergone a major change. Several new drafts of the definitions, referred to as the ICIDH-2, were created and trialled through the mid to late 1990s. The result was a change of focus, finalised in 2001, and named the International Classification of Functioning, Disability and Health (ICF). The aim of the new ICF classification was to "…provide a unified and standard language and framework for the description of health and health-related states" (International Classification of Functioning Disability and Health, 2004, p3). The ICF indicated that in the past there were two main health-related disability models: the social model and the medical model. The social model was a combination of the charity and rights model where disability was defined as a social problem. The medical model, as previously discussed, suggested that a disability was a problem of the person (International Classification of Functioning Disability and Health, 2004).

With the international health professions community accepting the ICF, the WHO believed it had promulgated new definitions of disability effectively. Disability could now be seen as a health issue affected by contextual factors. Kostanjsek (2004, p2) has recently defined 'disability' as follows:

> In the context of health, disability is an umbrella term for impairments, activity limitations and participation restrictions. It denotes the negative aspects of the interaction between an individual (with a health condition) and that individual's contextual factors (environmental and personal factors).

This definition endeavours to acknowledge the multi-dimensional nature of disability. The other associated terms within the ICF include these critical definitions: impairment is interpreted in relation to the functioning of body parts or organs; activity is seen in relation to the capacity of a person to do basic or complex

actions and participation is connected to the impact on a person's performance of basic or complex actions in relation to the surroundings (the environment) (Kostanjsek, 2004).

Essentially, the defining of the terms disability, handicap and impairment and associated later revisions clearly demonstrate that there is a close relationship between the changing views of society, their relationship with the creation of policy and the impact of such policy and legislation on people with disabilities. The use of the WHO's international classifications for disability-related terminology continues to provide a basis on which polices are formulated. Essentially, the way in which disability is currently conceptualised and the policy which is built on this concept have a close relationship in which each contributes to the evolution of the other. The current guidelines remain under constant review and are likely to continue evolving to mirror societal change.

1.7 Disability from the perspective of blind and vision impaired individuals

One disability group which is recognised as having an even greater struggle integrating into mainstream society is the group of people who are blind or vision impaired. In Australia, there are approximately 430,000 people who are vision impaired with an additional 50,000 people who are classified as blind. The two groups combined represent 5.4% of the population and it is predicted that this figure will rise to 6.5% over the next 20 years (Taylor, Keeffe, & Mitchell, 2004).

The history of vision impairment and societal response to people with this impairment are similar for all people with disabilities in that the construction of disability in terms of rights and equity have provided increased benefits for such people. However, the issue of blindness is often perceived differently from other disabilities by the able-bodied population. One study of social work students indicated that out of all disabilities, the prospect of blindness was deemed to be the most serious and anxiety provoking (McDaniel, 1969). In another more recent study of approximately 12,000 people, 91% ranked blindness as one of the most feared disabilities (Giridhar, Dandona, Prasad, Koval, & Dandona, 2002). The nature of

this fear in society has been caused by the association of a loss of vision with other losses such as the loss of independence, the loss of social skills and the loss of income. Blind Citizens Australia estimates that the current unemployment rate for people who are blind or vision impaired is around 20%, nearly four times the national rate (Tacticall, 2002).

One of the greatest difficulties faced by blind and vision impaired people, when compared to other people with disabilities, is gaining access to education (Murray & Armstrong, 2004). Classroom education, for example, is mostly visual in terms of the ability to read information on a board, the ability to create and view handwriting and the ability to view textbooks. The reliance on visual-based learning is increasing with the widespread adoption of computer-based technologies. Regardless of the mode of education, some key concepts are routinely graphically represented and therefore cannot be effectively described, particularly to those who have been blind since birth (Murray & Armstrong, 2004).

The different social constructions of disability have also had a greater impact on people with vision impairments. Often a blind person with a white cane can be observed having difficulties understanding the surrounding environment. Such an observation can reinforce both the charity model – pity - and the medical model - the perception of a physically noticeable difference from able-bodied individuals. Although the social perception of blindness may affect the way in which people interact with blind and vision impaired individuals, studies have shown that fear of blindness does not translate to a fear of a blind person (Giridhar, Dandona, Prasad, Koval, & Dandona, 2002). This separation between the disability and the individual, particularly in recent decades, has resulted in improvements in addressing the needs of vision-specific disabilities. The increase in blindness as a result of the demographics of an aging population may be driving the 'fear' that facilities may be required on a personal level in the future.

Shrout (1994, p1) reflects a common rhetoric used when addressing the concept of disability by stating that "each and every one of us knows moments of inability, when the body and mind that we take for granted let us down, refuse to work for us." Although this point of view is correct, the issue is more than an

occasional struggle for people with vision disabilities. Outside of the comfort zone of the home, a blind or vision impaired person meets navigational and comprehension challenges which include the location of obstacles and the interpretation of objects. A journey into the public realm can also generate the feelings expressed by Coloridge (1993) who indicates that there are those who still observe blind people and immediately perceive theirs as a tragedy or a loss. It is ironic that the attitude of others can cause blind people to be concerned about their own visual persecution. A blind person may not have vision but is very aware of the importance of this missing sense. Such awareness of negative attitudes towards physical appearance - the use of a cane, a guide dog or other disability-related aids - reinforces the differences between the blind individual and the rest of society. The combination of mobility difficulties together with these attitudes, can result in a blind or vision impaired person becoming fearful of potential difficulties and resentful of a world that does not understand.

Despite the difficulties, people who are blind or vision impaired understand that some proportion of the able-bodied population does not let the fear of blindness colour their attitude towards individuals. It is also true, however, that the able-bodied population can never truly understand the difficulties faced by blind and vision impaired people. Oliver (1996) suggests that it is the acts of society which expose a disability and that if disability-related issues were addressed, an individual would not be perceived as disabled. Such a view is highly applicable to people with vision disabilities because of the visual nature of our world. However, it is unrealistic to expect the world to underplay the importance of visual cues. The presence and importance of visual beauty, visual cues and visual interaction is a fundamental requirement of our humanity, whether on a physical or metaphorical level.

Parsons (1994) and Lansdown (1980) have indicated that the key to providing support to people with disabilities is through attitudinal and legal change. As previously discussed, there is a close link between attitudinal change resulting in more appropriate models of disability being accepted in society and concurrent changes in policy. Such changes are vital in improving conditions for people who are blind or vision impaired. Essentially, blind and vision impaired people are greatly

affected by the perception of disability and a fear of blindness. Although difficulties are faced by many disability groups, the combination of this fear, the visual nature of society in relation to learning and interaction and more generalised disability-related issues make this disability a more significant barrier to interaction with society.

1.8 Conclusion

This chapter clearly establishes that there is a strong link between the social construction of disability, policy ideologies, the creation of disability-specific policy and the impact of such policy on people who are blind or vision impaired. The exploration of disability in its social and historical context allows society to see that it is not a fixed concept but one that will always change with the attitudes of society. People with disabilities are significantly affected by such changes, reflected by the dominant model which gives expression to the social construction of disability. These effects can be negative, as represented by the perception of tragedy or loss in the charity model or the perception of inferiority as represented by the medical model. In contrast, the rights-based model and, to some extent, the market-driven economic model, can result in people with disabilities being treated in a positive manner, striving for equality and value. Both people with disabilities and able-bodied people alike have the opportunity to influence attitudes and, as such, perceptions will continue to change. Policy and legislation both reflect and contribute to the social construction of disability. Where the dominant social category is based on the charity model, policy approaches are generally negative. In addition, when the medical model features as the dominant social category, the maximal policy approach is more likely to be adopted. Currently, in most Western countries, the domination of rights-based and economic model social categories are reflected by rights-based and laissez-faire approaches to policy and legislative changes.

The creation of the definitions of impairment, disability and handicap are further evidence of how changes in society can directly affect the creation of policy. People who are blind or vision impaired, as with other disability groups, are in turn significantly affected by the implementation of such policy which can contribute to further changes in society. However, people with vision disabilities face additional barriers in relation to learning, mobility and access to visual information. The fear of

blindness within society also creates attitudinal barriers by reinforcing the view that such a disability can be restrictive when interacting in society. Essentially, this chapter identifies that society and policy and are key factors in affecting the welfare of people who are blind or vision impaired.

During the period of rapid social change, another significant movement was occurring: the evolution of computing and Internet technologies. For people with disabilities, the delivery of evolving technologies not only delivered new products and services but also delivered the hope of equality and independence. The following chapter explores the role of computing and the Internet and its impact on the welfare of people who are blind or vision impaired.

2.0 THE ROLE OF COMPUTING AND INTERNET-RELATED TECHNOLOGIES FOR PEOPLE WHO ARE BLIND OR VISION IMPAIRED

2.1 Introduction

The previous chapter identified that the changing of social categories and the creation of associated government policy and legislation had a significant impact on the welfare of people with vision disabilities. The ever-changing nature of society indicates that such changes have a significant impact in the present day.

This chapter focuses on the significance of change and policy on the welfare of people who are blind and vision impaired. In this instance, the change refers to technological change and corporate policy relating to the development of mainstream and disability-specific products and services. Through the changing of the dominant social category, interest emerged in creating new technological devices to assist people with vision disabilities. Led initially by the development of the white cane, blind and vision impaired people were given greater mobility and independence through the provision of information about their surroundings. The development of ultrasonic-devices for submarines also led to the creation of electronic-based mobility devices for blind and vision impaired people. These developments in assistive technology did not simply provide alternatives to an inferior body as suggested by the dominant medical model-based social category - they provided hope.

With the introduction of the personal computer, the hope for blind and vision impaired people shifted from mobility to improved equality and independence. Although some barriers existed in gaining access to such technology, the ability to access written material and manipulate data with the help of assistive technology devices established computing not only as a mainstream phenomenon but as a highly beneficial disability-specific tool. The introduction of the Internet provided additional hope of equality through the independent access of information and communication. This chapter contributes to this research by identifying the

significant benefits and barriers of computing and Internet-related technologies which affect the welfare of people who are blind or vision impaired.

2.2 The creation of the white cane and electronic-based technologies

The evolution of science has enabled society to incorporate tools, machines, materials and processes into human lives in order to resolve problems that otherwise could not be solved. Within the mainstream population, new technologies often extend the physical capability of the body so that humans can do more or achieve more in a shorter space of time. Two historical examples are the bicycle, which allowed humans to travel faster than merely depending on standard physical capacity and the telephone, which increased communication range. Carried to the next level, it may be argued that not having a tool could be viewed as a disability if others are still able to complete a particular task. For example, if individuals relied on the use of a forklift to move heavy weights, the absence of a forklift may effectively be a disability for that individual. For people *with* disabilities, new technologies that extend or develop physical capabilities provide more than just the restoration of the physical body; they also bring the promise of equity with the able-bodied population. Technologies that improve the physical or mental capability of the body might effectively cancel out disability-related difficulties. As such, technology can be an equalising force.

There are many examples of product development for people with disabilities which illustrate the importance of delivering improved physical capacity. The development of the wheelchair enabled mobility for people who have difficulty walking and the hearing aid provided sound to people with a hearing impairment. The desire to use emerging technologies to assist people with disabilities was driven largely by the changing of the dominant social category from a charity model-based viewpoint to a medical-based viewpoint. As discussed earlier in this thesis, the shift of social categories often led, in turn, to changing developments in areas that affected people with disabilities. Devices for people with disabilities were seen as tools to replace a diminished part of the body. Although the medical model focused on highlighting the inferiority of people with disabilities, the ramifications of

technological emergence provided substantial hope and movement towards a more rights-based independence and equality for people with disabilities.

New technologies can be particularly important for people who are blind or vision impaired because the improvements in technology can reduce mobility difficulties and lead to increased independence. The first important technological advance for people with vision disabilities was the lightweight long cane, developed by Dr. Richard Hoover in the late 1940s (Hoover, 1950). The cane revolutionised the way in which people with vision disabilities could access the world. People could walk around in their environments without colliding with obstacles. Using the cane to hit objects allowed for the detection of an obstacle followed by some determination of what that obstacle was. The simple though prominent colour and design were immediately recognisable and as such could warn other pedestrians to move out of the path of an oncoming blind or vision impaired individual (Brabyn, 1994). Other benefits for users included the ability to determine environmental conditions such as the texture and slope of the ground. Tapping the cane could also be used as a unit of measurement. Throughout the following decades, the cane has come to be seen as an extension of the body, part of the identification of a blind individual in our society. A mental picture of the surrounding environment could also be formed. The impact of this invention led to increased independence of movement and this ability, taken for granted by the able-bodied population but previously denied to people with vision disabilities, became available to them. Although the cane is highly beneficial in assisting the user and identifying them to others, there are limitations. Firstly, it has a very limited range, only allowing users to gain a limited understanding of the world around them one metre at a time. Secondly, it works only from the waist down meaning that head-height objects are undetectable. Nevertheless, the success of the traditional cane provided hope and independence to blind and vision impaired people and increased the desire to improve life through the development of other aids.

The next application of electronic technology emerged through the use of electronics within mobility devices. Inspired by the use of ultrasonic signals for the underwater detection of submarines during World War II, ultrasonic waves were seen as applicable to the development of commercial products, such as travel aids

for blind and vision impaired people ("Ultrasonic Sound Information", 2005). The implementation of electronics in mobility devices relied on the possibility that if electronic signal-based technology could detect objects underwater, the same technology could be used by blind people to detect objects when walking. As a result of this train of thought, based largely on the dominant medical model-based social category, the adaptation of existing electronic technologies was used to benefit people with vision disabilities. This development provided great enthusiasm in the hope that technologies originally designed for destruction could result in potentially beneficial products (Hollier, 2004).

The creation of electronic-based devices to assist people with disabilities became known as assistive technology or adaptive technology. Assistive technology is designed to temporarily modify a product into an accessible format, while adaptive technology is designed to permanently change a product to ensure accessibility (Australian National Training Authority, 2005). The shorthand term AT is generally used to describe either assistive or adaptive technologies, with 'assist' being defined as "to give support, to aid, to help" (Bryant & Bryant, 2003, p2). AT, then, is the method by which the practical implementation of technology helps and supports people. The development of AT can be separated into two parts: innovation-based products in which products are created specifically for people with disabilities; and adaptation-based products which involve making existing products accessible for people with disabilities (Kumar, Rahman, & Krovi, 2005). Although the ultrasonic technology used to create a new mobility aid is based on existing technology, it is not designed to make a mainstream device accessible to people with disabilities and is therefore classified as an innovation-based device.

The main goal for an AT product is transparency. If a product can be used effectively without training, then it is deemed to be a successful AT product (King, 1999). The use of ultrasonic signals in a mobility aid was believed to have the potential of becoming an effectively transparent product and so commenced the development of many types of Electronic Travel Aids (ETAs). The development of ETAs through the 1960s, 1970s and 1980s was significant in that ETAs were the one of the first groups of electronic devices developed for people with vision disabilities. These devices provided hope for improved access to mainstream activities and

materials. However, there was considerable debate as to how the ultrasonic sonar technology could be best used.

The development of the devices was based on two different schools of thought. The first focused on the issue of mobility, providing increased safety and independence when travelling through various environments. The second approach focused on orientation. It is difficult for a blind or vision impaired person to gain an understanding of spatial concepts and it was believed that the development of ETAs could provide great assistance in this area. As a result, two fundamentally different ETAs were produced. The first was referred to as a clear-path indicator and the second consisted of object analysis ETA. The clear-path system returned only information about objects which could form a hazard during movement (Foulke, 1971), warning the user before physical contact was made. The clear-path indicator could be used to identify several objects and allowed the user to make a determination as to the best method of negotiation. An example of a clear-path mobility aid is the Mowat Sensor. This small device, developed in New Zealand, detects objects utilising an elliptical ultrasonic beam covering 15 degrees in azimuth and 30 degrees in elevation. When the beam touches an object, the sensor reacts and the device begins to vibrate. The frequency of the vibration increases as the distance to the object decreases (Webster, 1994). Other similar devices include the Russell Pathfinder and the head-mounted Sonic Pathfinder (Webster, 1994).

An example of the object analysis system is the SonicGuide. This ETA uses two ultrasonic beams launched from a head mounted spectacle frame. The audio stream that is returned allows for the differentiation of tones between objects. Another approach to the object analysis system relies on the Global Positioning Systems' (GPS) data which are then interpreted by a computer to provide orientation information. A more localised alternative is remote signage which broadcasts audio messages from signs, allowing a blind or vision impaired person to obtain more information about the surrounding environment. This information is generally picked up by a handheld receiver.

Although clear-path and object-analysis ETAs are substantially different in terms of their design, both offered a hope to people with vision disabilities of

increasing their awareness of their surroundings. Furthermore, the evolution of ETA devices was instrumental in the creation of future electronic-based technologies because their development demonstrated that the use of electronic devices seemed to have a greater variety of solutions in resolving disability-related issues. Essentially, electronic-based technology offered more potential than simple mechanical tools. The widespread development of ETAs also illustrated that electronic solutions could help people with vision disabilities in other areas, such as the evolving area of personal computing.

Overall, the pioneering use of evolving technologies through the creation of the white cane and the use of electronics to create ETAs were vital in establishing the hope and potential of AT in improving the mobility and independence of people with disabilities. The work developed in this area demonstrated that electronics-based devices provided many different options for solving problems relating to people with vision disabilities. Such work laid the groundwork for future electronics-based AT devices in the computing arena such as the development of hardware-based voice synthesizers.

2.3 The hope of personal computing

The explosive growth of Information Technology (IT) and the development of the personal computer (PC) was seen as early as 1984 to be "…one of the most remarkable phenomena in recent history" (Davies, 1984, pi). Although there is considerable debate as to when the first PC was produced, it is generally accepted that computers became commercially successful around 1977 with the introduction of devices from companies such as Commodore, Radio Shack and Apple (Carlson, Burgess, & Miller, 1996). The IBM-PC, the platform on which most modern computing is based, was aimed originally at the corporate market, was introduced in 1981 and rapidly gained popularity.

There are many reasons for the initial success of the PC. One of the primary reasons was the ability to do fully functional word processing and other business applications with a great deal less time and trouble than the typewriter. Another was the opportunity to create graphical and sound compositions. Entertainment in the

form of computer games also rapidly gained a following. Over time, the potential of computers was discovered and numerous additional tasks could be achieved through the use of a PC.

Opportunities for computer access by people with vision disabilities arose with the introduction of AT devices for computers in the late 1970s. Inspired by the use of electronics in the development of ETAs, several hardware voice synthesizer prototype AT devices were developed and showcased during the 1981 International Year of Disabled Persons (Richards, 1982). A very important item to be developed at this time was the SYNTE2, one of the first microprocessor-based and portable speech synthesizers in the world. The development of these hardware voice synthesizers meant that, for the first time, individuals with vision impairment could interact with a personal computer. Other more sophisticated devices followed including the Brother Caiku, Eke, Humanica and Task, which utilise the Votrax speech synthesis chip (Lemmetty, 2004). Gaining access to personal computing provided much more to people with vision disabilities than simply relaying on-screen information. The ability to convert electronic text into other formats such as audio opened up unprecedented access to information. Furthermore, the ability to complete tasks quickly was in itself beneficial. However, the real power of the emerging technology was the ability to edit information – a very large step away from the unforgiving input process of a Braille typewriter (Hollier & Murray, 2004).

Throughout the late 1970s and 1980s there were many different 8-bit and 16-bit computers, with Commodore and Apple capturing a significant proportion of the home computer market; Atari capturing a significant portion of the computer entertainment market and IBM continuing to capture the business market (Carlson, Burgess, & Miller, 1996). In the early to mid-1980s AT devices were developed for multiple PC platforms to try and cater for the growing PC market. The development of AT products became dedicated primarily in the IBM-PC platform in the late 1980s because of the growing popularity of this PC as a business and educational machine and also due to the fact that most applications were largely text-based. By the late 1980s, AT such as speech synthesizers had been refined to a point where they could easily interpret text, making the AT products increasingly effective for people with vision disabilities (Lemmetty, 2004).

Improvements in computing for people with vision disabilities played a vital role in supporting new educational opportunities by providing access to educational materials previously inaccessible such as information in libraries where books were scanned and converted into electronic text. The conversion of written material into electronic text meant that the text could either be read aloud, or the colours and font could be manipulated to make it easier to see for people with low vision. When 'experimental' became 'everyday', these products also became more affordable to educational institutions and individuals. Consequently, at the close of the 1980s, people with vision disabilities were getting unprecedented access to education, an unexpected spin-off of this evolving computing technology. In essence, the impact of computing technologies provided additional hope for people with vision disabilities. The development of ETAs led to the development of AT products that not only provided translation services for text output but also emerged as a significant factor in allowing blind and vision impaired people unprecedented access to education and improved information access.

2.4 Overcoming the difficulties of the graphical user interface

The Apple Macintosh in 1984 was the first commercially successful computer using a Graphical User Interface (GUI) (Sanford, 2004). The GUI, which was initially developed by Xerox in 1973 (Carlson, Burgess, & Miller, 1996), led to a fundamental change in how computers were used. For the general population, the GUI was a major step forward in personal computing for the visual representation of data and its ability to perform multiple tasks at once heralded a new era of access to computers for the home user. However, for people who were blind or vision impaired, the change posed serious problems. The GUI format meant that many accessibility tools for people with vision disabilities previously available in text-based computing no longer worked and no replacements were available. Essentially, the use of graphics to represent information rendered most existing AT devices, which relied on text output, effectively useless (Necasek, 2004). The accessibility issues of the GUI are discussed further in section 3.5.

Until this point, AT devices were being created independently from other innovative computer software and hardware to equalise the benefits of the IT age for people with disabilities. In response to the introduction of the GUI, the development of AT shifted from the exploration of new beneficial technologies to a more urgent need to adapt existing technologies. Essentially, this meant that the efforts of creating AT no longer focused on developing new standalone products specifically for blind or vision impaired people. Instead, the focus was on ensuring that people with vision disabilities had access to popular mainstream products. In relation to the GUI, the focus on AT product development was in ensuring that the inaccessible environment did not prevent people with vision disabilities from continuing to use computers in a society increasingly dependent on them. As the operating systems did not effectively cater for people with vision disabilities, third-party companies developed software-based AT products to replace the text-based hardware-based products. These new software-based AT products were designed to offer a translation overlay service, interpreting inaccessible GUI information into alternative formats. This restored the promise of these new technologies while also providing access to some benefits of the GUI system, such as multitasking. Such products included text-to-speech programs called JAWS and WindowEyes and screen magnification software such as ZoomText and MAGic. A comprehensive explanation of software-based AT products can be found in section 6.5.3.

The creators of GUI-based operating systems have gradually included accessibility options into the interface. Initially Mac OS featured limited accessibility support while Windows did not feature any significant accessibility support until the release of the Windows NT Access Pack for business, and the release of Windows 95 into the home market (Microsoft, 2002). Much of the initial support was designed to assist the functionality of third-party programs but, in recent times, operating systems such as Mac OS have provided full screen magnification and text-to-speech features for people with vision disabilities. The Windows platform now supports numerous third-party applications for people with vision disabilities to provide access to the OS and are rumoured to have an improved accessibility interface in their next OS release. Variants of UNIX-based operating systems, such as Linux, also have limited but growing accessibility support. A comprehensive

analysis of the accessibility tools contained within current operating systems can be found in section 6.5.1.

2.5 The hope of the Internet

Arguably, the most important IT development in recent history has been the creation of the Internet, which allows computer users rapid access to communication and information throughout the world. The Internet, often seen as one of the most successful examples of sustained investment into research (Johnston, 2004), was first described in 1962 by J.C.R. Licklider (Leiner et al., 2002). The US government's Advanced Research Projects Agency (ARPA) was interested in the system for defence purposes and chose Licklider to implement a packet-switching network system (Johnston, 2004). The development of the ARPAnet project, as it became known, changed the computer from a solely mathematical tool to one that also enabled communication (Johnston, 2004). The initial ARPAnet gradually grew into the networking concepts that are understood today as the Internet, based on the idea that multiple independent packet-switching networks can exchange data over a variety of media (Leiner et al., 2002). The initial developments of the US military and the US educational institutions in the 1970s continued to expand through the 1980s. In 1992, the US government allowed the Internet to become a public resource. The move of the Internet into the public realm allowed anyone who chose to access the network access to send and receive data (Zakon, 2002).

In Australia, the impact of the Internet followed developments in the USA. The Internet in Australia is generally thought to have begun as a simplified network link between the University of Melbourne and the University of Sydney in the mid 1970s, known as the Australian Computer Science network (ACSnet). In the early 1980s a permanent connection with ARPAnet was established for the purpose of e-mail within computer science-related research areas. The establishment of the .au top-level domain also occurred (Clarke, 2001). After considerable discussion within government and tertiary institutions, formal international Internet Protocol (IP) links were established in 1989. This led to the formation of the Australian Academic and Research Network (AARnet). The first commercial Internet Service Providers (ISPs) for the general public appeared in the early 1990s (Clarke, 2001).

The entrance of the Internet into the public realm, as with personal computing, provided unprecedented opportunities for the exchange of information and communication. Such concepts were discussed, for example, in science fiction. In *Neuromancer*, by William Gibson, the term 'cyberspace' described a global network that linked all people, information and machines together in a way that could be navigated as if it were real space (Gibson, 1984). As global computing networks evolved, this term was adopted for the Internet. Throughout the 1990s the mainstream population began to use this global 'cyberspace', accessing information and communicating electronically. Through e-mail, chat programs for real-time discussion, newsgroups and mailing lists and commercial trade known as e-commerce became popular. In recent years, file-swapping software has allowed users to exchange music and other multimedia files between Internet users. Furthermore, the real-time creation and receipt of electronic messages allowed for instant and affordable communication around the world.

The emergence of the Internet may have been seen as another opportunity for people with vision disabilities to become more easily integrated in society. Access to text-based information provided true independence to people with vision impairments, allowing the use of adaptive-based AT devices, initially created primarily for the OS on a PC, to find online information (Goggin & Mewell, 2003). Access to independent information has also led to additional opportunities. Examples of these opportunities include access to online grocery shopping and online banking. These services are particularly beneficial because mobility and transport difficulties which often make shopping difficult are resolved through the access of online information and delivery services (Human Rights and Equal Opportunity Commission, 2002).

Although the Internet's ability to provide access to information is highly beneficial to people who are blind or vision impaired, the communication capabilities of the Internet can also play an important role in the lives of people with vision disabilities. The Internet is based around communication between computer networks so that there is exchange of information and communication between individuals. The media available for communication include text, voice and video.

Interaction can also be in message form or real-time. The first great advantage of this technology is that interaction with others online can be done without an immediate acknowledgement or recognition of a physical disability. It has been argued that the absence of a physical presence in an online situation, such as virtual reality or cyberspace, can be an equaliser and allow individuals to freely express their true identities (Balsamo, 1996). In this regard, online communication could be an equalizer for contacting other members of society.

Another important benefit of online communication is the ability to gain disability-specific support from others. Unlike the 'physical world', where it is difficult to meet by chance others with the same disability condition, theme-based discussions on the Internet allow people with similar interests, or similar disabilities, to communicate and share mutual difficulties. Discovering an online community for disability support is highly advantageous, especially for people who are blind or vision impaired. Physical meetings between blind people can be difficult due to the logistics of travelling and identifying people. The global nature of the Internet allows for communication with a variety of people with similar vision disabilities, which in turn provided unprecedented support of what may be deemed either a medical condition or environmental restrictions as a result of a disability. The fact that such meetings between online individuals are possible is, in itself, a remarkable technical feat. However, the potential benefits of process for people who are blind or vision impaired extends beyond participation. One of the greatest benefits of real-time online communication for this group is the perceived level of intimacy available to the individual. Lindlif and Shatzer (1998) indicated that such personal interactions start from a general social understanding of collective interests which provide opportunities to discuss subjects which may be difficult to approach in the physical world. Given the difficulty in locating support from people with similar disabilities and interests in the physical realm, the online realm can provide disability-specific support for people with similar disabilities making it easier to cope with disability-specific issues.

Although the privacy aspect of real-time chat on the Internet may be based more on perception than reality, it can successfully provide an opportunity for people to share with others and obtain a vital support mechanism. Bricout (2001) further

emphasises the significance by explaining that the general public are sometimes reluctant to interact with someone who has a disability due to a fear or uncertainly of how to interact socially with the person. Online communities not only provide support during this time, but essentially remove that barrier allowing for mainstream interaction (Price & Shildrick, 2002).

Ultimately the Internet can provide tremendous benefits to all users through wide access to information and to direct communication with others. These benefits are even more profound for people with disabilities and in particular, people with vision disabilities. One of the greatest benefits to this group is the ability to access information and communication services independently through a variety of services. In addition, the benefits of communication with other people sharing a similar disability has allowed for unprecedented disability-related support. For some, access to the Internet may be seen as an extension of the body. For that reason alone, the Internet is seen as a vital tool that helps to overcome disability-related difficulties. The use of a computer and the Internet in this manner can lift the self-esteem of people who are blind or vision impaired and drive them to achieve more on a personal level so that they can contribute more to society.

2.6 Overcoming the difficulties of the World Wide Web

Although the benefits of the Internet for people with disabilities are clear, the provision of new information and communication tools is not always possible due to accessibility issues. As with the GUI on the personal computer, one of the main Internet interfaces also went through a graphical transformation that presented difficulties to people with disabilities. The introduction of the HyperText Markup Language (HTML) by Tim Berners-Lee in 1992, led to the development of the World Wide Web (WWW), the graphical information-retrieving element of the Internet (Johnston, 2004). The arrival of the ‘web’ led to significant commercial development of the Internet around the world. The graphical interface provided new opportunities and services to the mainstream population but it rendered the provision of information largely inaccessible to people with vision disabilities. Benefits such as the ability to access multimedia information easily and the freedom for anyone to publish material on the WWW were incompatible with many of the existing AT

technologies which were initially focused solely on interpreting the GUI operating environment. As the WWW created a boom in online information access in the mid to late 1990s, adaptation-based AT devices required modification to keep up with the emerging technology.

The difficulty with this type of modification is the freedom of the individual to put information online in any format based on the HTML code structure. As web pages could be designed in numerous ways, it was difficult for AT devices to interpret inconsistent information correctly. In order to counteract this problem, the World Wide Web Consortium (W3C), the group established to monitor the development of the WWW, emphasised the importance of Universal Design and established a series of accessibility guidelines. These guidelines would, if applied to the creation of web pages, allow AT products to have a consistent code. This, in turn, would allow AT vendors to improve AT products and create a consistent interpretation for computer users with vision disabilities.

The concept of Universal Design attempts to guide the design of products and environments so that they can be used by all people, to the greatest extent possible, without the need for adaptation or specialised design (Mace, 2004). Two important elements are usability and accessibility. Usability refers to a measure of the successful implementation of a system (Interface Consult, 2004) while accessibility is a measure of the breadth of access regardless of disability (Berners-Lee, 2002). In practical terms, attention to these key elements should ensure that web sites are available to everyone in a manner that is easy to use and that the site is compatible with AT products. To ensure compatibility with AT products, the W3C developed a Web Accessibility Initiative (WAI). The initiative included the development of guidelines, tools, educational research and developmental research (World Wide Web Consortium, 2002). The main component of the WAI was the Web Content Accessibility Guidelines (WCAG), currently at version 1.0. The WCAG is designed as the practical implementation of Universal Design concepts in relation to the WWW. Compliance with the guidelines occurs through a series of web development checkpoints (World Wide Web Consortium, 2002). The guidelines have three priority levels, with each level mapping to an accessibility compliance standard.

The first compliance level, known as Single-A compliance, must meet all Priority 1 guidelines. Double-A compliance must meet all Priority 1 and Priority 2 guidelines, whilst Triple-A compliance must meet all three priority guidelines. The W3C (1999) released the guidelines and has defined the priority guidelines as follows:

> Priority 1:
> A Web content developer must satisfy this checkpoint. Otherwise, one or more groups will find it impossible to access information in the document.
> Priority 2:
> A Web content developer should satisfy this checkpoint. Otherwise, one or more groups will find it difficult to access information in the document.
> Priority 3:
> A Web content developer may address this checkpoint. Otherwise, one or more groups will find it somewhat difficult to access information in the document.

The priority guidelines outline specific web page coding techniques for HTML and Cascading Style Sheet (CSS) which include the elements that are needed to ensure accessibility. These sit alongside guides for general colour, formatting and language use to ensure accessibility across a range of disabilities. Single-A compliance is designed to ensure basic accessibility to people with disabilities. Double-A compliance is designed to improve accessibility with particular emphasis on real-time and language information. Triple-A compliance focuses on ensuring compliance for pages specifically designed for people with disabilities.

The application of universal design concepts through the introduction of the guidelines for the WWW was highly significant for several reasons. Firstly, the creation of the guidelines was vital in helping web developers provide access to web pages for people who are blind or vision impaired. Secondly, the guidelines provided consistency as a basis for AT developers to continue improving their products. The third and possibly most important benefit of the guidelines is that it helped restore the hope that the gathering of information from the Internet could once again become sufficiently accessible for vision impaired people. The full list of the WCAG guidelines version 1.0 can be found in Appendix C.

2.7 Conclusion

This chapter demonstrated that computing and Internet-related technologies have played a significant role in the welfare of people who are blind or vision impaired. The creation of the white cane and other mobility aids led to the development of assistive technology which was successful in proving a vital framework of improved equality and independence in the achievement of everyday tasks. Although there were difficulties accessing initial computing developments and the popular graphical user interface, the personal computer heralded unprecedented access to disability-specific information resources.

The Internet continued to provide benefits to people with visual disabilities through access to independent information retrieval and disability-related communication. The development and use of such technologies also demonstrated that corporate policy played a vital role in the provision of such tools to ensure that the technology, which promised so much, was both available and accessible. Such technologies also improved the welfare of people with disabilities through enhanced educational opportunities which in turn led to improvements in addressing issues of poverty and unemployment. The contributions of this chapter to the research study are that computing and Internet-related products and services not only promote equality and independence but can also potentially address other disability-specific issues present in our society.

Yet despite the dominance of the rights-based and economic category in society and the significant role of computing and the Internet in the welfare of people with disabilities, it is clear that many barriers remain that are preventing people with vision disabilities from embracing these benefits. The next chapter explores the nature of these difficulties and how they relate to the way in which society has focused on providing access to mainstream technologies for people with visual disabilities.

3.0 ELEMENTS OF THE DISABILITY DIVIDE

3.1 Introduction

The previous chapters have identified that social and technological changes have a profound effect on the welfare of people with disabilities. In fact, it is vital that people who are blind or vision impaired have access to computing and Internet-related technologies to ensure equality and independence as such changes occur.

However, there are significant barriers which currently prevent access to computing and the Internet for this disability group. These barriers have resulted in a separation of computer and Internet access between the able-bodied population and people with disabilities. For the purpose of this thesis, the division is referred to as the disability divide. This chapter identifies the nature of the disability divide and draws together the associated development and technical issues which contribute to the difficulties faced by people with disabilities.

3.2 Current access to computing and the Internet

It is clear that access to computing and the Internet has become a global phenomenon. There are currently an estimated 670 million computers used in the home, with the International Data Corporation (IDC) estimating that this figure will reach one billion in 2010 (Kanellos, 2004). In Australia, approximately 66% of the population, or 13.3 million people, use a personal computer in the home. This figure is also likely to continue to rise in the future (Australian Bureau of Statistics, 2003b). In terms of Internet usage, there are approximately 800 million users, or 12.5% of the global population who use the Internet (Miniwatts International, 2004). This figure is higher than the number of personal computer users due to fact that the Internet is often used on computers which are not owned by the user, including those in use in business and educational environments. In Australia, approximately 12.3 million people, or 53% of households have Internet access (Australian Bureau of Statistics, 2003b). As indicated by Figure 3.1, the usage of computers and the Internet in Australia continues to follow global trends in usage since the 1998 census.

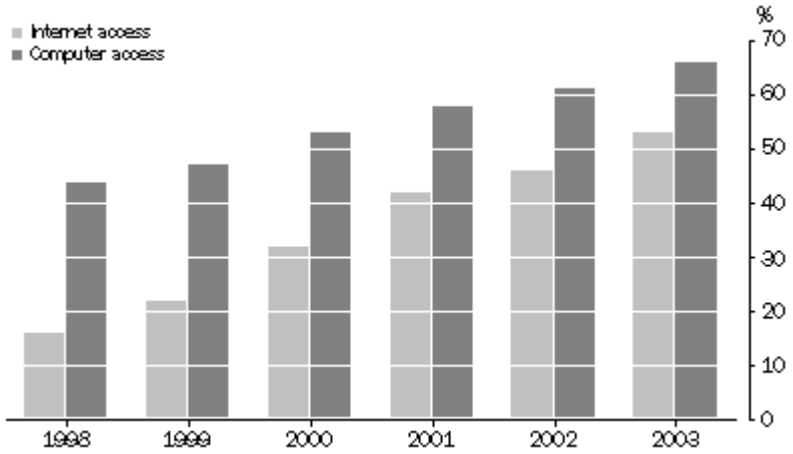


Figure 3.1 Household Computer or Internet Access in Australia 1998 to 2003 (Australian Bureau of Statistics, 2003b)

This phenomenon has been integral to the modern era, particularly in relation to the accessing of both information and communication. As indicated previously in sections 2.3 and 2.5, there are specific additional benefits for people with disabilities and, in particular, for people who are blind or vision impaired. The benefits for this group extend beyond those available to the general public through the provision of previously inaccessible resources such as written text being converted into electronic formats and increased independence through the use of the Internet for information retrieval. The ability to access information from many sources while remaining in one place, is a major opportunity for those facing mobility difficulties based on their disability. The same can be said for an array of communication possibilities. Nevertheless, statistics suggest that people with disabilities are not embracing computing or Internet technologies at the same or faster rate than the able-bodied population, despite such significant benefits. Government statistics recently published in Australia (ABS, 2004) show that approximately 48% of people with a disability have access to a computer. This is approximately 18% less than the general population. In terms of Internet usage, approximately 39% of people with disabilities are household Internet users, 14% less than the total population (Australian Bureau of Statistics, 2003b). Other Western countries, such as the USA, have similar statistical results (United States Census Bureau, 2000). Essentially, these statistics demonstrate that computer usage and the Internet are increasing throughout the world. However, people with disabilities are not using computing and Internet usage at the same rate as the able-bodied population.

3.3 The digital divide and the disability divide

The occurrence of a gap between a section of society which has access to technology and a section of society which does not have access is often referred to as a digital divide, a term first used in the USA in the mid-1990s (World Wide Words, 1996). Examples of a digital divide can include telecommunication facilities between city and rural areas, computer usage between richer and poorer areas and Internet access between the able-bodied population and people with disabilities. The existence of a digital divide suggests that there is currently a lack of equity in the availability of these vital technological developments. Recent research into potential digital divide issues found that although computers and the Internet are seen as global phenomena, there are more computers in the USA than anywhere else in the world. This emphasises the inequity of technological provision. Furthermore, over 40% of Internet users are from North America (Digital Divide Network, 2002). On this basis, the use of personal computing and the Internet can be said to be unevenly distributed in the world, with a divide between the rich nations and those who are less well off.

Another aspect of the digital divide concerns specific groups within society who are not gaining access to computing and Internet-related technologies. In Australia, the government department formerly known as the National Office of the Information Economy (NOIE), now known as the Australian Government Information Management Office, examined this issue to determine which groups in society suffered the most from a digital divide. The report established that the groups least likely to access technologies such as the Internet include "…those on low incomes, aged over 55, with disabilities, without tertiary education, or living in rural or remote areas, of indigenous heritage" (National Office of the Information Economy, 2002). The NOIE report confirmed that there is a digital divide between people with disabilities and the able-bodied population in Australia and this issue is of national importance. This report indicates that it is not simply about computer access. The difficulties faced by people with disabilities, highlighted earlier in this thesis, also contribute to the digital divide issues. Poverty, unemployment and a lack

of tertiary education compound the effect of the digital divide for people with disabilities.

For example, if a person has a disability, it is more difficult to obtain employment resulting in a diminished capacity to earn money. It is also likely that such a person would have other disability-related expenses, such as the purchase of specialised equipment, which affect the money available for 'buying in' to the computer market (World Bank Group, 2004). As a result, issues revolving around a lack of income and unemployment are particularly significant for people with disabilities. Furthermore, a study of vision impaired Internet users found that there is an exclusivity of access to information on the Internet, restricted to the wealthy and highly educated sections of the community. The study stated that "…participation in the so-called information age is even more fraught with difficulties…" (Williamson, Albrecht, Schauder, & Bow, 2001, p690). By inference, those without wealth or education, including those with a disability, may be excluded from computing and Internet access.

Disability can often limit the extent of education that can be achieved and this lays the foundation for even more difficulty in gaining full participation in employment and access to concomitant financial resources. In Australia, only 24% of people with disabilities have completed high school to Year 12 as opposed to 49% of the able-bodied population. The completion rate of a diploma or other higher educational qualifications is 14%, half the rate of the able-bodied population at a 28% completion rate (Australian Bureau of Statistics, 2003a). This lack of tertiary education would make it more difficult for people with disabilities to gain the knowledge and experience of using computers and the Internet, which would in turn compound the difficulty of any disability-specific issues which may prevent access. In relation to people who are blind or vision impaired this disability divide is even more severe. In terms of employment, Blind Citizens Australia estimates that the current unemployment rate for people who are blind or vision impaired is approximately 20%, nearly four times the national rate (Tacticall, 2002). Therefore, the lack of employment has contributed considerably to people who are blind or vision impaired having low income levels. In terms of education, the learning undertaken in a typical classroom environment is highly visual. People who are

blind from birth, especially, have difficulty understanding spatial concepts (Murray & Armstrong, 2004). This decreases the opportunities for further education and, again, disadvantages people with visual disabilities. Such evidence suggests that of the different disability groups, the group of people who are blind or vision impaired is one of the most disadvantaged disability groups in terms of accessing computer and Internet-related technologies, even without considering the highly visual nature of personal computing. When the difficulties of the GUI and the WWW are added, it was no surprise that a USA study in 2001 indicated that although 57% of the total US population used the Internet, only 21% of people with limitations in seeing had access (Gerber & Kirchner, 2001). This gap is "…more dramatic than recent findings from studies of general disability" (Gerber & Kirchner, 2001). There is no census information available from the ABS to confirm this phenomenon in Australia. However it might be assumed to be similar in this country.

In summary, research suggests that there is a digital divide between people with disabilities and the able-bodied population. This disability divide is a direct consequence of disability-specific difficulties and it is compounded by issues of poverty, unemployment contributing to poverty and a lack of tertiary education. Such issues are even more severe for people who are blind or vision impaired.

3.4 The interaction of changing social categories and assistive technology development

The existence of a disability divide indicates that, despite the potential of both mainstream and disability-specific benefits to people with disabilities from computing and Internet-related technologies, real access to such benefits remains difficult. Therefore, it is important to identify what are the fundamental disability-specific barriers preventing people who are blind or vision impaired from accessing such vital products and services. The way in which computing and Internet products and services have been created has changed along with the changing of disability as a social category. The examination of the different models earlier in the thesis highlights how disability can be perceived differently. Those differences can also indirectly affect people with vision disabilities by determining the way in which AT products are made. The change from the charity model to the medical model led to a

desire to repair the inferior body of people with vision disabilities. The development of products which, in turn, led to a more rights-based concept of equality and independence. However, in addition to the motivation for creating such products, the success or failure of such products can also have a profound impact of disability perception. The ETA, for example, could have provided equality and independence. Indeed, such devices did generate this hope. Yet if the ETA could not effectively deliver the promised mobility benefits, or if it is significantly flawed, the concept of a blind person struggling to use an ineffective ETA can emphasise the perception generated by the charity model. The added danger of such a failure is that the manufacturer may not perceive the issues, resulting in an unusable product with no prospect of further advancement. The example above was often true in regards to the ETAs and other technological devices being developed. Whether inaccessible mainstream IT products or flawed disability-specific products, such barriers past and present prevent access of computing and Internet-related technologies to people with disabilities.

Despite the potential of the initial aids designed to help people with vision disabilities, a vast majority of the aids achieved their production goals but were largely unsuccessful in being adopted by blind and vision impaired people. Although the development of the traditional white cane was highly beneficial in providing mobility and independence to people with vision disabilities, the endeavours with the ETAs were not as successful. Statistically, only 1% of all blind and vision impaired individuals actually use an ETA (Sardegna & Paul, 1991). On this basis it would be reasonable to assume that the ETAs do not effectively meet the needs of their target audience. A personal interview conducted with Bill Gerry, an ETA technician for the Smith-Kettlewell Institute in San Francisco, revealed that the consultation process is vital in developing an effective ETA. Gerry explained that there are seven main requirements of an ETA:

- simple to use
- easy to interpret mobility information
- discreteness of mobility device
- public understanding of mobility device

- detection of objects within a normal visual range (approximately 180 degrees)
- assist in crowded places and
- does not interfere with other senses.

Gerry believes that in the excitement of using post-World War II technologies to assist blind people combined with possible profiteering, the consultation process was bypassed in an effort to get the products on the market.

When examining the existing ETAs, it can be seen how a lack of consultation has resulted in several key requirements being missed. The Russell Pathsounder, for example, was designed to provide a clear central path for the user yet it is unable to detect all objects and the auditory output distracts the user. The Mowat sensor, although discrete to use, cannot pick up drop-offs or overhead objects which means that a vision impaired user cannot trust the output of the object. Other ETAs have additional problems. The Sonic Pathfinder, a head-mounted device, attracts attention from the public causing embarrassment to the user. The Sonic Torch and SonicGuide provide feedback through the audio interpretation of a raw ultrasonic signal which creates unpleasant feedback that would require a significant amount of training to interpret the signal correctly.

Despite these difficulties, the ETAs were still beneficial in highlighting the way that electronics could be used to assist people with vision disabilities. As previously discussed, such development led to important initiatives in ensuring accessibility to the personal computer. However, the lack of consultation, especially in post-development, meant that potentially highly beneficial technology was effectively rendered useless to blind and vision impaired people.

3.5 Accessibility barriers of personal computing

The development of mainstream computing carried significant hope for people with vision disabilities. Yet the initial offerings did not cater for people with disabilities and as such led to the creation of the first disability divide. In particular, the development process of technology for people with disabilities did not progress as rapidly as the rest of the IT industry. With the exception of IBM, few mainstream

computing firms seemed to take issues of accessibility seriously, and it became apparent in the mid 1980s that, in order for people with disabilities to benefit from the computing revolution, it would require a major shift in public education practices to truly highlight the needs of people with disabilities in the development of AT products (Lansdown, 1980).

Most of the development of AT was provided by specialist providers. This helped in closing the initial disability divide gap as it provided access to mainstream computing. However, not all AT developments were completely successful. Firstly, there was a gap of several years between the initial acceptance of the PC and the provision of AT devices. By the time AT products were developed, a significant gap had developed between people with disabilities and the able-bodied population in gaining access to technology. Secondly, the price of the AT equipment was extremely high due to what was perceived to be a limited market with largely experimental technology (Hollier & Murray, 2004).

Another contribution to the disability divide came from the several different types of computer systems in the 1980s. With so many competing 8-bit and 16-bit computing platforms in the market, it was difficult for legislators to formulate any disability-specific IT policies regarding IT accessibility and difficult for makers of AT products to solve all needs. For example, educators wishing to buy AT equipment had to contend with the risk that a purchase might soon become redundant if computing systems changed. The fear in disability circles was that this lack of action would result in severe computer access inequity, causing one of the more disadvantaged sections of our society to become alienated from a world that was becoming increasingly technologically dependent (Gergen, 1986).

Although such difficulties led to much of the hope offered by new computing technologies being replaced with frustration, in the mid-to-late 1980s the disability divide was bridged to some extent as AT technologies became more reliable and more affordable. The dominance of the IBM-PC in business and educational circles helped to establish one particular platform for AT development and legislation in the USA and other Western countries was starting to be applied to the development of new computing technologies.

Unfortunately, the development of such technologies was hampered by the otherwise successful introduction of the GUI. Historically, the introduction of the GUI to the general public heralded many significant advantages to personal computing. These included the ability to comprehend symbols faster than text, the fostering of more concrete thinking, the establishment of context, more attractive presentation and the ability to reverse incorrect actions easily (Galitz, 2002). As the advantages of the first GUI offerings were recognised, other computer manufacturers scrambled to produce their own versions of GUI-based operating systems. For the IBM-PC platform, the IBM OS/2 and Microsoft Windows in the late 1980s and early 1990s encouraged further software development in support of these GUI interfaces (Lessard, 2004). Currently there are three major variants of operating systems in the home market. Two of these operating system families, Microsoft Windows and UNIX-based variants such as Linux, run on computer hardware based on the original x86 PC architecture pioneered by the IBM-PC. The other OS is Mac OS which is supported by a combination of generic and Apple-propriety hardware. In terms of usage, the different variants of Microsoft Windows combined represent approximately 90% of the x86-based PC market share with UNIX-based operating systems, such as Linux, representing nearly all of the remaining 10% of users. Computers based on the original x86 PC architecture represent 97% of worldwide computer sales. The Macintosh has an estimated 2-3% of the worldwide market, yet it is highly regarded in key industry areas and retains a loyal user base (Davison, 2004). The specific features of these operating systems are discussed in section 6.5.1.

Although the advantages of the GUI and its current market dominance enable the GUI to be highly productive, the greatest advantage in using a graphical interface over a command-line interface is the fact that most people find visual learning easier and more natural. It has been noted that "…in human beings, actions and visual skills emerged before languages" (Galitz, 2002, p19). While the move away from text towards graphics ensured that computing would become inherently easier for the general mainstream population, for people who are blind or vision impaired the fundamental advance of visual learning in computing effectively destroyed the ability for this group to use a computer for many years. The GUI not only created

an operating environment which was inaccessible to people with vision disabilities but it also rendered much of the existing AT equipment useless, since the AT equipment relied on the output of text from the computer and most devices were unable to convert the graphical information into a text-based output. In addition to the inaccessibility of the GUI there are other disadvantages. Firstly, the use of the GUI means that there is a need for greater design complexity in computer software. Secondly, the intuitiveness of a computer may have improved with the GUI but learning is still necessary and that learning is more dependent on the overall 'look' over the interface. Thirdly, performing simple tasks has been made harder for blind and vision impaired people. What once took a few quick commands to achieve now requires more interaction.

As a result, the removal of computing access from people with vision disabilities also meant the removal of functionality from existing AT equipment. Furthermore, people with vision disabilities had to replace redundant, expensive equipment and face the inaccessibility of emerging technologies. The software-based AT technologies have only become effective since the turn of this century, some fifteen years after the initial launch of the graphical interface. The introduction of the GUI effectively resulted in a second disability divide. This again demonstrated a lack of consultation with people who are blind or vision impaired. If a significant amount of consultation had been undertaken before the launch of this graphical OS, it may have been possible to ensure that accessibility features were included. Further consultation after the development of the GUI could have potentially produced more benefits to this product.

3.6 Accessibility barriers of the Internet

The development of the Internet heralded the potential for unprecedented access to information, a potential that was realised more fully with the introduction of the World Wide Web (WWW). The WWW was to provide universal access to information across all boundaries. By 2002, WWW creator and director of the W3C, Tim Burners-Lee (2002) stated that "the power of the web is in its universally. Access by everyone regardless of disability is an essential aspect".

Prior to the WWW, virtually all Internet tasks, including the location of information, were text-based. As with the GUI and personal computing, the WWW improved access to the Internet for the mainstream population. The ability to learn via visual means provided a greater understanding of information retrieval which in turn caused the Internet to grow exponentially. Through the 1990s the Internet moved from simply providing information and communication resources to becoming an interactive multimedia experience. The difficulty with this approach is that for a multimedia experience to work, the individual must be capable of using both hearing and eyesight. Although people with hearing impairments can find some multimedia aspects of the Internet unusable, the WWW, like the GUI, is weighted far more towards visual observation, resulting in people with vision disabilities being one of the most disadvantaged groups in gaining access to online information (Goggin & Mewell, 2003).

There is a historical trend in the development of new technologies that tends to deny people with disabilities access to promised benefits of that technology. The development of the ETAs harnessed some of this great potential, but a lack of consultation rendered the devices ineffective. The GUI provided many benefits to the mainstream population, but these were again denied to people with vision disabilities due to a lack of consultation. Once again, in the rush of developing new graphical access to Internet-related resources, people with vision disabilities were left struggling to gain access to information. One of the most frustrating aspects of the Internet from the perspective of people with vision disabilities is that the use of multimedia presentations on web sites can prevent access to text information. There is essentially no formal process built into the creation of HTML code which ensures accessibility. This means that a search of the WWW will generally result in the location of some accessible pages, some semi-accessible pages and others which are inaccessible (Harper, Kingsbury, & Hassell, 2002).

In order to ensure accessibility, web pages must conform to the W3C web accessibility guidelines as previously discussed in section 2.6. There has been some minor criticism of the accessibility guidelines due to the fact that it is possible to make an inaccessible site that is W3C compliant. However, it is highly likely that if the guidelines are used during the development of web sites, the site will be

accessible and compatible with AT products. Yet the current reality of web accessibility is that most web developers do not use the W3C guidelines unless enforced by policy or legislation. People are, therefore, either simply not aware of web accessibility issues or make a conscious choice not to use the guidelines. The role of legislation, which can moderate accessibility, is discussed below. The reason that the guidelines are necessary is partly due to the fact that most AT products used to access the Internet are the same AT products that are used to interpret the GUI on a computer. The GUI has changed little on the PC since the release of Windows 95 and, as such, the developers of AT products have been able to refine the interpretation of the GUI on this platform. In order to interpret web pages, many AT products endeavour to interpret the web page based on HTML instructions. If these instructions conform to the Web Content Accessibility Guidelines (WCAG), the AT product can generally provide an accessible output to the blind or vision impaired user. If these guidelines are not followed, the AT product will not be able to interpret the page and the user will struggle to access the information.

The significance of the disability divide in terms of web accessibility was highlighted in June 1999 when Bruce Maguire, a blind man, lodged a complaint with the Human Rights and Equal Opportunity Commission (HREOC) against the Sydney Organising Committee for the Olympic Games (SOCOG) over his inability to access the Sydney Olympic Games web site. The issue was initially raised as part of a request for the Olympic ticketing information to be produced in Braille. As part of trying to access information, Maguire discovered that the web site was inaccessible to his screen reader. The main issue was due to the use of images without text descriptions provided by ALT tags. The text descriptions are vital to AT products which 'read out' web pages, using these descriptions to inform the user about the images. This case highlights the importance of the WCAG in assessing web site accessibility. The legal significance of this case is discussed later in section 5.3.

In essence, the biggest difficulty for all people with vision disabilities is the lack of consultation regarding the needs of blind and vision impaired individuals. As demonstrated in the following examples, there is a need for a three-stage process when producing products and services for people with vision disabilities: the initial consultation for the establishment of need, the creation of the product and the testing

of the product with the target audience. The initial consultation is vital in establishing that there is a need for the development of a particular product or service. It is also important to collect ideas from the people who will ultimately be using the product on how it could be used and how it should feel. For example, a product may be fully functioning but if it is too heavy or consumes battery power too quickly, the product will never be used. Naturally many of these people may not be fully aware of the technical requirements but it is important to take the needs of the group into consideration. The second stage is the creation of the product itself. This process combines the consultation information from the first stage with the technical specifications generated by the product creators and designers. This stage should incorporate development, creation and internal testing so that the product can be ready for use with people who are blind or vision impaired. The third stage is the second consultative process. This stage is vital in ensuring that the product not only works but will also prove to be genuinely beneficial and user-friendly. This stage gives the product designers the opportunity to see the product in action and to make changes if necessary. In the case of mainstream devices used by people with disabilities, there is often no consultation at all with people with disabilities as it is not deemed to be necessary. When disability-specific devices are created, the initial consultation stage often occurs but there is frequently little consultation once the product has been produced in order to get the item to market.

3.7 Conclusion

This chapter has demonstrated that people with disabilities, and in particular people who are blind or vision impaired, are unable to use computing and Internet-related technologies as effectively as the mainstream population. Statistical evidence suggests that this digital divide for people with disabilities, or disability divide, is a serious issue that is linked with other disability-related issues such as poverty, unemployment and a lack of educational opportunities.

This research has identified that the disability divide is a reoccurring phenomenon that is influenced by changes in society, policy and the provision of computing and Internet products and services. Due to a lack of consultation with people who are blind or vision impaired, emerging technologies do not effectively

cater for the needs of this group. Examples include the GUI and the WWW. Even disability-specific products are often unsuccessful in addressing the needs of people with disabilities.

In order to find solutions to the disability divide, it is first necessary to understand which specific government policies, corporate policies and IT products and services are causing the current accessibility issues for people who are blind and vision impaired. The following chapters explore the current nature of the disability divide through interviews with government and corporate organisations.

4.0 DISABILITY-SPECIFIC POLICY AND LEGISLATION

4.1 Introduction

Previous chapters have identified that changes in society and changes in technology affect the welfare of people with disabilities. Clearly such changes offer potential benefits to people with disabilities, yet these benefits are largely undercut by difficulties that occur during the transition process. New technologies adopted by the mainstream, for example, are often not accessible to people who are blind or vision impaired. This cyclic issue is identified in this thesis as the disability divide.

In order to identify the specific issues of the current disability divide, it is necessary to examine the role of such changes through the creation and implementation of policy. As indicated earlier, policy is created as a reflection of the views of society, and the implementation of such policy, in government and corporate realms.

The purpose of this chapter is to discover specific policy and legislative issues which are contributing to the disability divide. Although the creation of disability-specific and IT-based legislation and policy have improved the welfare of people who are blind or vision impaired, it is necessary to examine the different frameworks offered by Australia and the USA to determine the effectiveness of the delivery of IT tools and resources.

This examination is achieved through interviews with key individuals in policy and legislative development, the exploration of historical policy and legislative development, the role of current legislation and the significance of current disability and IT legislation for people with vision disabilities.

4.2 Methodology for personal interviews

In order to gather current information from these areas, personal interviews were organised with representatives from government organisations, media organisations, mainstream IT corporations and AT-specific corporations. The reasons for using personal interviews to gather this data were due to a number of factors.

Firstly, there is relatively little information regarding the way in which government, the media and IT corporations cater for the IT needs of people who are blind and vision impaired and as such it was important to go directly to the source.

Secondly, the personal interview process ensured that the interviewee would allocate an uninterrupted block of time for the study. In many corporate and government organisations, it is difficult for participants to find the time to complete print-based interview questions within their regular working hours. In addition, a personal interview allows the interviewee to gain a better understanding of the reasons for the interview and their role in the study. The following Australian people and organizations were interviewed:

- An anonymous Senior Policy Advisor, *Department of Family and Community Services*, Canberra. Interview conducted 24 June 2003.
- Ellis, Annette (MP). Disability Spokesperson for the *Australian Labor Party*, Canberra. Interview conducted 25 June 2003.
- Hathaway, Ron. Managing Director, *Humanware (formerly PulseData)*, Sydney. Interview conducted 19 June 2003.
- Hazell, Phil. National Manager, *Humanware (formerly PulseData)*, Sydney. Interview conducted 19 June 2003.
- Hill, Tony. President, *Internet Society of Australia*, Canberra. Interview conducted 23 June 2003.
- Huta, Peter. Manager, Community Connectivity, *National Office of the Information Economy (NOIE)*, Canberra. Interview conducted 26 June 2003.
- Lundy, Kate (Senator). Labor *Shadow Information Technology Minister*, Canberra. Interview conducted 26 June 2003.
- Miles, Alan. Project office for Digital Divide research, *Australian Capital territory Government*, Canberra. Interview conducted 24 June 2003.

- Parker, Cameron. Network Developer, New Media Division, *Australian Broadcasting Corporation (ABC),* Sydney. Interview conducted 20 June 2003.
- Rapley, Stephen. Network Editor, New Media Division, *Australian Broadcasting Corporation (ABC),* Sydney. Interview conducted 20 June 2003.
- Reilly, Fiona. Senior Policy Officer, *Office of E-government of Western Australia*, Perth. Interview conducted 24 September 2003.
- Sales, Jenny. Acting Executive Director, *Office of E-government of Western Australia*, Perth. Interview conducted 24 September 2003.
- Webb, Kerry. Web Architect/Project Officer, *Australian Capital territory Government*, Canberra. Interview conducted 24 June 2003.

The following international people and organizations were interviewed:

- Basson, Sara. Manager, Accessibility Services, *International Business Machines (IBM)*, New York, USA. Interview conducted 14 July 2003.
- Beard, Marney. Manager, Accessibility Programs, *SUN Microsystems*, California, USA. Interview conducted 8 July 2003.
- Bourdon, Chris. Senior Product Line Manager, Mac OS X division, *Apple Corporation*, California, USA. Interview conducted 8 July 2003.
- Gordon, Steve, Senior Director, *Cisco Systems*, California, USA . Interview conducted 9 July 2003.
- Hassell, Jonathan. Manager, Standards and Guidelines, New Media division, *British Broadcasting Corporation (BBC)*, London, England. Interview conducted 29 July 2003.
- James, Mary-Beth, Manager, Assistant Technology Developer, *Apple Corporation*, California, USA. Interview conducted 8 July 2003.
- Moulton, Gary. Product Manager, Accessibility Division, *Microsoft Corporation*, Washington, USA. Interview conducted 7 July 2003.
- Scott, Quentis. Project Manager, Services Division, *Government Services Administration (GSA)*, Washington DC, USA. Interview conducted 16 July 2003.

- Steger, John. Senior Consultant, Accessibility Services, *International Business Machines (IBM)*, New York, USA. Interview conducted 14 July 2003.
- Takemura, Michael. Director, Accessibility division, *Hewlett-Packard/Compaq (HP) Corporation*, Texas USA. Interview conducted 11 July 2003.

The people selected for the interviews, whose views are discussed across the next three chapters, were all highly skilled and vital to the overall decision-making processes of their respective areas. Australian legislative IT and disability policy were effectively represented through interviews with senior policy advisors from the Department of Family and Community Services and the Australian Government Information Management Office, formerly known as the National Office of the Information Economy. State-based legislation was effectively examined through the comparison of two significantly different areas, Western Australia and the Australian Capital Territory in conjunction. Other state-based information was also examined.

In relation to the provision of online information, the Australian Broadcasting Corporation demonstrated the availability of local content whilst the British Broadcasting Corporation provided a valuable comparison as it is renowned for its ability to provide media information in an accessible format. The corporate views are effectively represented through interviews with six of the world's largest multinational corporations: Apple, Cisco, HP, IBM, Microsoft and Sun. The interviews were conducted with accessibility representatives of these corporations. In addition, companies which specialised in the development of AT were represented through interviews with Humanware (formerly PulseData). The information gathered in these interviews provided a direct insight into how effectively society's current IT framework caters for people with disabilities.

Interviews which were requested but not granted were: the Australian Federal Minister for Information Technology, the Australian Federal Minister for Family and Community Services, the Premier of Western Australia, a representative from Freedom Scientific whose company produces the AT products JAWS and MAGic,

and a representative from AiSquared, the company who produced the product ZoomText.

The initial task of organising interviews proved to be a difficult process. In many cases, general telephone enquiries were blocked at the switchboard because the name of a specific individual in the organization could not be provided. As such, much of the contact information for the various companies was located through Internet searches. Once the information was located, e-mails were used to establish contact. Although this approach was effective for many groups, there were some organizations that could not be contacted using this method. In the case of IBM, it was necessary to visit the local office based in Perth and to ask if they could pass an interview request to their head office in New York, USA. Shortly after the visit to the local office, a representative from the New York office agreed to an interview request.

In order to gain an overall insight into the way in which government, media and corporate policy was planned and executed, it was determined that a qualitative methodology would be most appropriate for this area of the study. As indicated by Cavana and Delahaye (2001), a qualitative interview approach is effective when a problem needs to be defined, followed by the establishment of the conceptual or theoretical framework for the study. The conceptual nature of how successful organisations are in providing IT and Internet-related technologies to people with disabilities suggested that this interview technique would be successful in gaining significant knowledge about this area of study. Once the personal interview technique was selected, the questions were designed to ensure that the required information could be gathered from the individuals being interviewed. Hickman and Longman (1994) indicated that there are four key points which will ensure that the objectives for the interviews are met. These points focus on ensuring that:

- all questions asked are open questions
- the interviewer uses ‘active listening’ to incorporate follow-up questions
- notes are taken during the interviews and
- observations are used to judge if the interviewee’s answers are causing discomfort.

All of these points were used with the exception of visual observation. As previously indicated, it was difficult to determine effectively the interviewee's emotions through visual cues due to limited vision, but attention was paid to other cues such as movement and auditory response changes. The objectives of the interviews were designed to mirror the overarching study objectives.

In order to achieve these objectives, the interviews consisted of approximately 20 standard questions with several additional organisational-specific questions. The topics raised within the questions focused on the advantages and disadvantages of the Internet for the general public; the advantages and disadvantages of the Internet specifically for people with disabilities; the advantages and disadvantages of the Internet specifically for people who were blind or vision impaired; the individual role of the interviewee; the overall organisational role of the individual; the perception of the disability divide; the organisational understanding of how people with disabilities use IT and Internet-related technologies; the effect of legislation in this area; the relationship between government and industry, and potential future trends.

Prior to the interview process, each interviewee was requested to sign a copy of an information sheet and a consent form. The information sheet was designed to outline briefly the nature of the study. A full copy of the information sheet can be found in Appendix A. A consent form was provided to ensure that all interviews were conducted in compliance with the research requirements of Curtin University of Technology and also to ensure that all interviews were in accordance with the National Statement on Ethical Conduct in Research Involving Humans. A full copy of the consent form can be found in Appendix A.

In essence, the personal interviews were used to determine the current state of the disability divide in relation to the creation and implementation of government policy. They were also used to determine the provision of online information by government and the media and the way in which corporations create their products and services, both for the mainstream and for disability-specific users.

4.3 Historical development of disability and information technology legislation

In the 1970s, the move towards a rights-based approach to managing disability saw equity and social justice become the primary basis for the development of policies guiding the treatment of people with disabilities. Although there was little initial support for improvements in disability-related legislation, when the WHO released official definitions for the terms disability, impairment and handicap, the establishment of disability policy and legislation through the early to mid-1980s became easier to create. In Australia, the primary piece of legislation was the *Disability Services Act* (DSA), 1986. Within the same time period as the move to a rights-based social category was the dawn of personal computing which, itself, was often understood in terms of a liberation, of sorts, from some physical constraints. As people discovered the benefits of personal computing, Western governments were presented with a challenge to create legislation that could meet the emerging legal issues that had appeared as a result of such technology.

Although there were no significant policy developments at this time regarding the IT needs of people with disabilities, the development of disability-related policies and the struggle to legislate for emerging computing technologies provided many benefits to people with vision disabilities. Firstly, the development of legislation led to a refinement of disability-related terminology and an increased societal acceptance of people with disabilities as equals (Sutherland, 1981). Secondly, and arguably one of the most significant results from changes in disability policy and IT legislation, was increased access to education. Countries such as the United States and Australia had notable increases in the enrolment of people with disabilities in tertiary institutions through the 1980s due directly to various public laws and legislation in the USA and Australia (Clear, 2000), and also because the possibility of education now seemed achievable in the rights-based social climate. The increase in educational opportunities for people with disabilities was complemented by the development of computing technologies. The increased access to personal computers in tertiary environments meant that people with disabilities had more opportunity to study at tertiary educational institutions and completion

rates improved significantly due to the availability of personal computers and associated assistive technologies (Hollier & Murray, 2004).

However, despite the use of computing technologies in education by people with disabilities, support within the IT industry for this group was still marginal. Few mainstream computing firms seemed to take issues of accessibility seriously, and it became apparent in the mid 1980s that in order for people with disabilities to keep up with the computing revolution, it would require a major shift in public awareness to highlight the needs of people with disabilities in the development of AT products (Lansdown, 1980). In legislative terms, it has proved difficult to produce up-to-date and relevant IT legislation linked to disability. The numerous computing products and platforms in the mainstream area made it difficult for general IT policy which in turn made it difficult for disability-specific IT policy. As a result, the legislators in the 1980s focused more on disability-specific policy rather than the combination of disability and IT policy. Although the evolution of computing technologies was still deemed to be too volatile for specific IT-based legislation for people with disabilities, the ongoing public education of the needs of people with disabilities gained significant strength during this time (Bricout, 2001).

In the early 1990s, the disability-related legislation which began to appear also had implications for the use of IT by people with disabilities. One of the most significant pieces of legislation for people with disabilities in Australia appearing in 1992 was the *Disability Discrimination Act* (DDA) issued by the Federal government. In addition, the Federal government released its first major policy initiative regarding the IT needs of people with disabilities, the *Commonwealth Disability Strategy* (CDS). Other significant legislation to appear at this time includes the US *Americans With Disabilities Act*, 1990, which provided a good framework for people with disabilities. In recent years, the USA has also produced legislation that specifically caters for the IT needs of people with disabilities. This legislation was brought in to amend the US *Rehabilitation Act*, 1973, and it is commonly known as Section 508. The creation of such legislation was highly significant because its effective implementation can have a direct impact in the emergence of new opportunities for people with disabilities. As previously discussed, legislation is effectively the reflection of the current social category of

disability. Although legislation is rarely created to address specific access issues, it has been, and continues to be, a factor in the provision of benefits or detriments to people with disabilities.

4.4 Australian and United States policy frameworks

4.4.1 Australian framework

In Australia, at a Federal level, the *Disability Services Act*, 1986 (DSA) provided the framework for society to implement a number of disability support services. These services are designed to provide greater independence for people with disabilities and reflect a move away from policies of institutionalisation (Baume & Kay, 1995). The original Act was criticised for not ensuring compliance, but this omission was rectified in 1999 by amendments that implemented Law Reform Commission recommendations (Clear, 2000).

The DSA focuses on the areas of accreditation and certification for services and programs relating to people with disabilities, funding of services for people with disabilities and the provision of services for people with disabilities. The overall objectives of the act (Australian Federal Government, 1986) are as follows:

(a) to replace provisions of the Handicapped Persons Assistance Act 1974, and of Part VIII of the Social Security Act 1947, with provisions that are more flexible and more responsive to the needs and aspirations of persons with disabilities;
(b) to assist persons with disabilities to receive services necessary to enable them to work towards full participation as members of the community;
(c) to promote services provided to persons with disabilities that:
  (i) assist persons with disabilities to integrate in the community, and complement services available generally to persons in the community;
  (ii) assist persons with disabilities to achieve positive outcomes, such as increased independence, employment opportunities and integration in the community; and
  (iii) are provided in ways that promote in the community a positive image of persons with disabilities and enhance their self esteem;
(d) to ensure that the outcomes achieved by persons with disabilities by the provision of services for them are taken into account in the granting of financial assistance for the provision of such services;
(e) to encourage innovation in the provision of services for persons with disabilities; and

(f) to assist in achieving positive outcomes, such as increased independence, employment opportunities and integration in the community, for persons with disabilities who are of working age by the provision of comprehensive rehabilitation services.

The implementation of the DSA highlighted the move away from the social category of the medical model into a more rights-based policy model. According to a senior policy advisor in the Department of Family & Community Services and also the Australian Labor Party (ALP) disability spokesperson Annette Ellis, the Federal role primarily focuses on employment-related issues. The policy advisor stated that the ultimate objective of the Federal government was to "…do ourselves out of a job" in terms of ensuring job placement. Essentially, the DSA is designed to improve and promote access for people with disabilities to employment, thereby ensuring more independence for people with disabilities through the financial security and personal growth involved in employment.

The *Disability Discrimination Act*, 1992 (DDA) is designed to complement the DSA by recognising the rights of people with disabilities and to limit disability-based discrimination. The DDA is similar in many ways to the US *Americans with Disabilities Act* (ADA), 1990, focusing on service provision and civil rights issues (Drake, 1999). The objectives of the DDA (Australian Federal Government, 1992) are as follows:

a. to eliminate, as far as possible, discrimination against persons on the ground of disability in the areas of:
   (i) work, accommodation, education, access to premises, clubs and sport; and
   (ii) the provision of goods, facilities, services and land; and
   (iii) existing laws; and
   (iv) the administration of Commonwealth laws and programs; and
b. to ensure, as far as practicable, that persons with disabilities have the same rights to equality before the law as the rest of the community; and
c. to promote recognition and acceptance within the community of the principle that persons with disabilities have the same fundamental rights as the rest of the community.

The DDA reflects the dominance of a rights-based model focusing on ensuring equity within the community, within employment and within education. If such rights are violated, the DDA provides a framework for appeal against perceived

discrimination. In other words, people with disabilities are understood to have rights that need to be protected, rather than being medically inferior or charitably pitied members of society.

Neither the DSA nor the DDA directly refer to computers, the Internet or technological requirements for people with disabilities. This is probably a reflection of the time at which they were written and enacted, but nevertheless they are broad enabling legislative moves rather than area or subject-specific acts. The task of interpreting the application of the DDA to ensure equity in areas relating to IT is left to the Human Rights and Equal Opportunity Commission (HREOC). However, both the Federal and state governments have internal policies for the provision of online government information. Although the government has no specific IT legislation to ensure that such information is provided to people with disabilities, there are internal policies that control how government publications are effectively presented in an accessible online format through the Commonwealth Disability Strategy (CDS).

The CDS was implemented in 1994 as part of a Federal government 10-year plan for "…Commonwealth departments and agencies to remove barriers in Commonwealth policies, programs and services for people with disabilities" (Australian Department of Human Services and Health, 2004, p1). The CDS was implemented in recognition of the fact that government policy has a significant impact on the lives of people with disabilities who are more than normally dependent on government agencies and such policies must be implemented with great care. The CDS was refined in 1999 to have a more ongoing commitment. The aims of the CDS (Australian Department of Human Services and Health, 2004) are as follows:

- to provide information in accessible formats
- to employ people with disabilities
- to purchase accessible services
- to recognise people with disabilities as consumers of services and
- to consult with people with disabilities to find out what they need.

The CDS objectives relating to online information is addressed by the Office of Government Online. The Federal IT and telecommunications aspects of the CDS are implemented by the Australian Government Information Management Office, formerly known as the NOIE. The HREOC provides a process for resolving

disability-related discrimination issues. The CDS operates within the legislative framework of the DSA of 1986 and the DDA of 1992.

Although the Federal government has the primary role in legislation, the states and territories have passed complementary legislation to address additional disability-related issues. This legislation also included measures aimed to make government information accessible. The Federal government also acknowledged that part of the Federal government's role was the provision of online services. An interview with a representative of the Australian Government Information Management Office, formerly known as NOIE, said that there were several internal reports which suggested that there is a direct saving to people with disabilities in travel costs and logistical issues by providing services online. At a state and territory level, the role of government in relation to the IT needs of people with disabilities is somewhat different in terms of the views between state and Federal policy. In order to gain an understanding of state and territory issues, interviews were carried out with representatives of the WA government and the ACT government.

In terms of active policy, interviews with representatives of both the WA and ACT governments revealed that the primary responsibility of these and other states and territories in terms of IT and Internet-related technologies was the provision of state and territory-based government information online. The advantage of this is that people can access the information as they want, when they want. The Federal Shadow disability spokesperson Annette Ellis and Shadow IT Minister Senator Kate Lundy believe that the states should play an important role but that the issues of disability-related access to Internet-related technologies would be better served by a national framework. According to Senator Lundy, the current government is trying to keep IT legislation technologically neutral to ensure legislation applies to future technological developments.

In essence, the Australian policy and legislative framework provide direct control over how services are provided to people with disabilities and how discriminatory matters are addressed. These issues are handled by the DSA of 1986 and the DDA of 1992. Although there is no direct Federal legislation to support the IT needs of people with disabilities, the CDS offers guidance regarding the provision

of Federal government online information and various state and territory-based legislation addresses state and territory-based online accessibility issues. Legislation and policy are currently neutral in terms of listing specific technologies within the policy guidelines.

4.4.2 United States framework

Prior to 1990, the USA did not have any specific legislation that addressed issues of discrimination towards people with disabilities. The ADA was designed to rectify this issue by providing a framework to prevent discrimination against individuals with disabilities throughout society (Mondak, 2000). The US Congress believed that the introduction of this legislation would break a number of artificial barriers and give people legal recourse if a discriminatory situation were to arise.

The ADA contained five major sections examining employment, public services, public accommodations, telecommunications and miscellaneous issues (United States Department of Justice, 2002). In relation to practical concerns, these sections of the ADA have resulted in technological improvements such as the provision of Braille dots on Automatic Teller Machines (ATMs) and government documents becoming available in alternative formats. The need for accessible communication also extended to the Internet with a need for US government web sites to be ADA compliant (Waddell, 2002). The main disability and IT-related pieces of legislation were implemented at a Federal level and included the ADA and the *Rehabilitation Act* (RA), 1973. The RA Section 508, contains specific IT legislation for people with disabilities. Unlike Australian legislation, the US legislation referred specifically to IT products and services in the IT legislation.

The Section 508 legislation complemented the ADA and received significant attention. In 1998, the US Congress amended the RA to require Federal agencies to make their electronic and IT devices accessible to people with disabilities. The Section 508 amendment was designed to go further than the inferred requirements of the ADA by specifically targeting IT barriers and encouraging the development of accessibility-based technological products (United States Federal Government, 1998). The other primary difference between Section 508 and the rest of the ADA

was that Section 508 only applied to US Federal government agencies. As a result, the US Federal government will not purchase any IT equipment unless it passes certain accessibility criteria. It also applied to the internal development of IT products and services (United States General Services Administration, 2003).

The RA and Section 508 provided many benefits to people with disabilities in the USA. Firstly, any person with a disability employed in the USA was provided with an accessible workplace under law. Secondly, such legislation put pressure on manufacturers to ensure product accessibility due to the large buying power of the US Federal government. Thirdly, there was an anticipated flow-on effect in that companies spending a great amount of time creating accessible products for the US Federal government were likely to use similar designs for products released to the general public, thus improving the accessibility of IT to the wider community.

The primary disabilities addressed by Section 508 included people with vision disabilities, hearing disabilities and motor disabilities. In terms of specific assistance for people who are blind or vision impaired, Section 508 included requirements for AT support in the form of screen readers, refreshable Braille displays, voice recognition software and high contrast colour schemes (United States General Services Administration, 2003).

An interview conducted with representative Quentis Scott, from the office of Government Services Administration (GSA), responsible for the implementation of Section 508, revealed that there was a significant focus on ensuring that the needs of people with vision disabilities were taken care of in this policy. In addition, people with vision disabilities were extensively consulted during the policy development process. Section 508 was initially drafted in 1998 but was not implemented until 2001. Scott indicated that the primary reason for the delay was that it took a significant amount of time to ensure the correct development of standards for the legislation. Although it is the responsibility of companies to provide proof that their products meet Section 508 compliance, the US government, through the GSA, have information kits available to provide companies with compliance information.

The introduction of Section 508 had a profound impact on the provision of computing and Internet technologies to people with vision disabilities. Many corporations began to include accessibility tools in their operating systems, software applications and hardware designs. The need to ensure that products could be sold to the US government also resulted in accessibility tools being made available to the general public, given that the same products were often designed for the mainstream consumer market. This is also a good example of the economic model at work, whereby the pursuit of profit has enabled people with vision disabilities to have better access to mainstream technologies.

In essence, the US legalisation is largely Federal-based. The ADA provides the structure for disability-related services and discriminatory issues whilst the RA, featuring Section 508, ensures accessibility compliance internally and forces companies to produce accessible IT equipment of they wish to sell their product to the US government.

4.5 Benefits and problems of Australian and United States policy and legislation

In Australia, the way in which policy affects the disability divide results from both Australian and US policy and legislation. The Australian legislation provides a framework in relation to the provision of disability-related services and government online information, but it is the US legislation that affects how computing and IT products cater for people with disabilities due to the fact that most multinational IT corporations are based in the USA. Virtually all of Australia's computing and Internet needs for a person with a disability are provided by US companies and hence subject to US law during development.

Australian legislation has little impact in controlling how products and services are provided to people with disabilities. Australia produces little IT equipment and the lack of IT support means that the DSA and the DDA cannot directly cater for the IT needs of people with disabilities. Ellis stated in relation to Section 508 that "we don't have anything like that", and Senator Lundy believed that it is important to develop technology-specific legislation for people with disabilities

in order to combat the disability divide. As such, Section 508-style legislation would provide a more effective framework, allowing the Federal government to provide a uniform approach across the states and territories. Unlike the USA, there is no technology-specific legislation for people with disabilities in Australia and any complaint regarding IT-based discrimination is a matter of interpretation by the HREOC. Although the US Section 508 applies to the large majority of IT products manufactured, the significance of Australian Federal legislation in regards to the IT needs of people with disabilities is ambiguous and makes it difficult when addressing Australian-specific issues.

One of the difficulties in enforcing the DDA of 1992 when there is no IT-specific legislation can be found in Section 11, termed Unjustifiable Hardship. Section 11 of the DDA (Australian Federal Government, 1992) is as follows:

> For the purposes of this Act, in determining what constitutes unjustifiable hardship, all relevant circumstances of the particular case are to be taken into account including:
>
> (a) the nature of the benefit or detriment likely to accrue or be suffered by any persons concerned; and
> (b) the effect of the disability of a person concerned; and
> (c) the financial circumstances and the estimated amount of expenditure required to be made by the person claiming unjustifiable hardship; and
> (d) in the case of the provision of services, or the making available of facilities-an action plan given to the Commission under section 64.

One significant example of where such a defence was used against the accessibility of IT for a person with a disability is the *Bruce Maguire v SOCOG* case, briefly referred to earlier. The respondent used the argument of unjustifiable hardship to prevent a repeat of the inaccessible 2000 Sydney Olympic Games web site. Wilson (2003) indicated that the current definition of unjustifiable hardship makes it relatively easy for government and corporate entities to avoid responsibilities in such issues. Although the defence was unsuccessful for SOCOG, this Section removed the need for SOCOG to address the accessibility issue. The resulting payment for damages to Maguire was also not sizable enough to be a deterrent for ongoing compliance by others.

In relation to the CDS, the final point emphasises the importance of consulting with people with disabilities to find out what they need. This point is vital in minimising the significance of the disability divide and finding ways to address the issue. The senior policy advisor representing people with disabilities and the representative from NOIE both indicated that they honestly do not know if people with disabilities are well informed about what the government can provide for them and have been unable to effectively determine their needs in terms of Internet-related technologies. Ellis perceives this as being a fundamental flaw, indicating that the current government believes that any non-employment issue must be dealt with by the states and territories. Senator Lundy indicated that she did not have a thorough understanding of the needs of people with disabilities in relation to IT either but that the community groups she had spoken to were well informed.

Both the WA and ACT government representatives also indicated that, due to the autonomous nature of government departments, it is extremely difficult to find out collectively what people with disabilities need. It is essentially left up to the individual departments to determine accessibility and need. The WA Office of E-government sees its role as informing the various departments of their legal obligations, but the departments have to choose whether or not they wish to be informed and whether to act on that basis. The ACT government representatives reported that most of their information comes from similar interdepartmental discussions. The ACT government has acknowledged some of these issues and created a report that examined ways to improve access to information. The report, titled *Bridging the Digital Divide* (Rooksby, Weckert, & Lucas, 2002) suggested a three stage solution consisting of providing access to computing and Internet-related technologies, providing training to those who are unable to use the equipment and ensuring that AT devices were affordable, possibly through a government subsidy (Rooksby, Weckert, & Lucas, 2002). One of the key recommendations in the report was the need for the government to liaise directly with both people who faced a disability divide and companies who provided AT products. When the WA government representatives were asked about the ACT report, they dismissed most of its findings due to the sheer size of land and population, stating that widespread discussions with disability groups, training and subsidies were simply not practical.

Such views again highlight the inconsistencies between governments at a state and territory level in addressing disability divide issues.

Although the US legislation has a more effective framework in addressing the IT needs of people with disabilities, there are issues that need to be addressed even in that country. Hood (1996) observed that the ADA had not always been used for its intended purpose. Examples raised by Hood include the use of the ADA as a means of getting lump sum unfair dismissal payouts rather than supporting the hiring of people with disabilities and he noted that the ADA has not helped severely disabled Americans.

In terms of IT development, there is considerable debate as to whether or not the ADA actually covers important issues such as the accessibility of web sites. The ADA views the public accommodation of services as a requirement for equal access to people with disabilities, even if they are operated by private entities (Winn, 2001). On this basis it was assumed that this legislation would apply to companies that issued web sites containing public information. Yet recently, a US court ruled that organisations providing online services do not need to comply with this act. This means that although US government web sites must meet accessibility criteria, companies displaying public information are not obligated to ensure their information is accessible. This decision upholds a 2002 ruling in which it was deemed the ADA only applies to physical spaces, not web sites. The case was originally filed against Southwest Airlines due to the inaccessibility of their web site (Royal National Institute of the Blind, 2004). The ongoing ambiguity of the significance of the ADA in relation to the disability divide makes it difficult for Americans to rely on its significance.

One of the biggest criticisms of Section 508 from a government standpoint is that it does not have enough 'teeth'. Quentis Scott from the GSA indicated that, although companies are required to meet stringent accessibility standards to sell products to the government, once they have been accepted it is difficult to determine liability should a company stop complying with Section 508. In essence, once a company is accepted, little more is required and at this time of writing, no company has been prosecuted for failing to comply with Section 508. There is also some

ambiguity as to how far Section 508 can comply. As noted by Scott, companies selling products to the US Federal government do not need to ensure that their web sites are W3C compliant as, although the site may be used to display available products and control purchases, the web site itself is not being sold to the government and is therefore excluded from the Section 508 requirements. Furthermore, there are areas of the government in which Section 508 does not apply. The US Executive branch of the Federal government is exempt and other areas of the US Federal government can apply for an exemption if they can demonstrate an undue burden in implementation (U.S. General Services Administration - Center for IT Accommodation, 2003).

Multinational corporations are also very critical of Section 508. When interviewed, the Microsoft representative indicated that the guidelines need to go further to provide incentives for the production of more OS-based accessibility and an increased development of AT products. The IBM representative was also critical of the dubious nature of the policy in terms of non-compliance. One representative stated that the success of Section 508 "…depends on how it's monitored…how it's implemented…in terms of penalties." The main concern of the Apple representatives was that such policies tend to provide an 'end point' for developers rather than pushing the boundaries of accessible technology. As discussed earlier in section 4.4, the representatives believe that Section 508 provided a good start but it needs to keep evolving as technology evolves. One of the representatives at IBM expressed concern about how the policy is applied as it was initially targeted for the end-user in the Federal government but the final implementation resulted in it having to apply to everyone, leading to the creation of the exemption process. The main criticism from the HP representative was that although Section 508 requires products to be accessible, it doesn't directly state how accessible, again resulting in the potential 'end point.' Essentially the HP representative indicated that accessibility would only be included in a product until it is complaint with Section 508. The HP representative described this as being a potential "…slap in the face" for people with disabilities.

The weakness of Australian legislation and the reliance on US-based IT legislation is highly significant in the issue of the disability divide. People with

vision disabilities must rely on US corporations to comply with US legislation in order to ensure product accessibility. Should discrimination occur, HREOC is left with the unenviable task of trying to determine IT rulings without the support of Australian IT policy.

Essentially, in Australia, current legislation is effective in providing support to people with disabilities in terms of the provision of services and addressing a majority of discrimination issues. However, the lack of IT-specific Section 508-style legislation means that rulings must be made based on the DDA making any IT-specific rules for people with disabilities ambiguous. Although Section 508 is effective in encouraging US-based IT companies to make accessible products which are sold in Australia, there are few restrictions on this legislation framework.

4.6 Conclusion

This chapter has identified policy and legislative issues that need to be rectified in order to reduce the impact of the disability divide. Historically, legislation has had a significant impact on providing opportunities to people with disabilities. In Australia, the DSA and the DDA were, and continue to be, used to support the need for disability services and to prevent discrimination. In relation to disability and IT-related issues, the legislation has been interpreted by HREOC to determine the importance of IT accessibility. Although the states and territories offer complementary policy and legislation, these policies are often not strictly followed due to the autonomous nature of government departments.

In relation to the computing and Internet products, society is largely reliant on Australian legislation for disability support and US-based legislation in relation to the provision of IT products and services, most of which are imported from the USA. Although Section 508 in the USA provides indirect support to people in Australia regarding the accessibility of IT products, it does not provide direct coverage to people with vision disabilities and has its own limitations, such as the lack of a provision to provide accessible public information.

In essence, the current policies are helpful to people with disabilities, but the lack of enforceable Federal IT-based legislation for people with disabilities in Australia has resulted in an inadequate framework for addressing the disability divide. The following chapter explores this matter further by examining the practical implementation of existing policy, legal precedents relating to web page accessibility and the ability for government and other information providers to deliver accessible information to people who are blind or vision impaired.

5.0 THE PROVISION OF ONLINE INFORMATION

5.1 Introduction

The previous chapter identified the key Australian and US policy and legislative frameworks that affect the disability divide. In order to demonstrate the effectiveness of these policies, it is necessary to explore how such policies are implemented. The provision of online information demonstrates how these policies are implemented by ensuring information access to people who are blind or vision impaired.

In the recent past, access to written materials required assistance either through having the information read out by a third party or by having it converted into an accessible format such as Braille. Computing and Internet-related technologies have not only allowed access to information, but have also enabled people with vision disabilities to access the information independently.

However, in order for blind and vision impaired people to gain access to this information, the text contained within web pages must be created in an accessible format which is compatible with existing AT products. The accessibility of Internet information depends on how the web page is designed, how the AT product can access that page and the policies in place to ensure that accessibility requirements are implemented. If these issues are not effectively addressed, barriers form which prevent access to online information, creating a substantial component of the disability divide.

This chapter contributes to the research by exploring the role of the government and media information providers and investigates the impact that government policy and legislation has in terms of effectively addressing the disability divide issues associated with the provision of online information.

5.2 The provision of government online information

Governments are major providers of information, particularly for people with disabilities. It is imperative, therefore, that such vital public resources are made available by governments in an accessible format. Given that electronic-based information is usually independently accessible to people with vision disabilities, the Internet provides a useful medium for the distribution of such information so long as it is done correctly. As previously discussed, the provision of government information in Australia is determined at a Federal level by the Commonwealth Disability Strategy (CDS) and at a state level by various state-based policies. At a Federal level, the primary policy designed to ensure accessibility in the distribution of online information is the CDS. However, despite the importance of such a policy, there is much conjecture over the success of the CDS in ensuring that all Federal government web pages meet the minimal W3C guidelines. Currently there are numerous Federal government sites which do not comply with the minimal W3C standard despite the presence of the CDS.

This inaccessibility of government information contributes directly to the disability divide as people who are blind or vision impaired remain unable to access vital information despite the provision of AT designed to support such access. Australia has, through the CDS, attempted to improve access but it is not working as effectively as it might. The aim of the CDS is to provide information in accessible formats. However, according to the senior policy advisor to the Minister of Family and Community Services (FACS), numerous government web sites do not comply with the minimal Single-A W3C guidelines. The advisor likened this situation to the locking of a cupboard and indicated that it resulted from departments either not being made aware of the CDS or simply not being able to make their web sites accessible under their current structure. Web sites such as that of the Australian Bureau of Statistics (ABS) feature notes in places stating that some web pages are inaccessible, particularly to people with vision disabilities and that the information should be obtained by calling the organisation direct. The advisor indicated that many agencies do not really understand the significance of the W3C guidelines or simply do not understand how to implement the various priority checkpoints. The ALP disability spokesperson, Annette Ellis, agreed stating that most people are aware that issues

exist but not how to resolve the problems. Another example of an accessibly problem concerns Adobe Acrobat PDF files. Both the senior policy advisor and Senator Lundy agreed that PDF files, although very useful to the able-bodied population in presenting documents in a small file size, are still highly inaccessible for the most part for people with vision disabilities. Overall, Senator Lundy indicated that, from a political perspective, "there is a big mess in the online service delivery by the Federal government" that is not currently being addressed.

The second and third requirements of the CDS are to employ people with disabilities and purchase accessible services. As previously noted, the unemployment rate of people with disabilities, particularly people with vision disabilities, is significantly higher than the national unemployment rate. Although the objective is important, the statistical information suggests that it is not being effectively achieved. The objective of purchasing accessible services is certainly commendable, but there is no legislative framework that requires the government to pursue this strategy. As noted in section 4.4, Senator Lundy believes that the current government is trying to implement non-technology-specific legislation to ensure that the policies do not become outdated.

One item on which all interviewees at both Federal and state level agree is that the major detriments to people with vision disabilities using the Internet is anything which restricts the ability to access information or communication. Examples such as spam, security issues and the reliability of information were cited as being major difficulties faced by people with disabilities. Although all interviewees acknowledged that there are issues in providing information to people with vision disabilities, they did not concede that government contributed to the disability divide problem. As described by one of the representatives at IBM, people will only do what you inspect, not what you expect. The failure of the CDS and state or territory-based policies are not due to a lack of idealism but due to the fact that there are no requirements for an Australian government at any level to adhere to the strategy. The difficulty in defining the differences in roles between state and Federal levels, in combination with a lack of compliance, ultimately results in a lack of accessible government information for people with vision disabilities. Although the government departments indicate that they support accessibility and are

endeavouring to address such issues, the result is that people who are blind or vision impaired are likely to have an inconsistent experience when locating government information. This again results in a disability divide for information retrieval.

5.3 Legal precedents regarding access to information technology for people with disabilities

The policies regarding provision of online information by government appear to have limited impact, but at least they are guided by policies that take account of disability needs. There is no IT-specific policy relating to provision of IT for people with disabilities outside of the government sector. For example, there is no obligation for private industry to ensure that public web site information is accessible. As previously discussed, the DSA and the DDA must be interpreted by HREOC should issues regarding the provision of computing and Internet-based technologies for people with disabilities arise. In recent years the importance of access to online information has increased due to the near exponential increase of online information. Two of the most significant cases in this respect are the *Scott v Telstra* case and the *Maguire v SOCOG* case.

The *Scott v Telstra* case came about when a hearing impaired man requested that TTY services be provided for the cost of standard telephone services (Clear, 2000). Scott argued that the refusal of Telstra to meet this request resulted in Scott losing access to business opportunities, telecommunication facilities and most importantly, access to emergency services. The ABS estimated that approximately 35,000 people could potentially be discriminated against due to similar disability requirements, leading to the HREOC ruling that Telstra had an obligation to cater for equal telecommunications access to people with disabilities (Bourk, 2000). This case was highly significant as it was the first in Australia to demonstrate that the IT needs of people with disabilities must be supported in particular circumstances. The case demonstrated that people with disabilities have a right to expect the provision of AT products in relation to telecommunications.

The second and highly relevant case was *Maguire v SOCOG* (already mentioned above). In 1999 a blind man named Bruce Maguire required ticketing and

race information for the Sydney 2000 Olympic Games. Part of his complaint was that the information available on the official Olympic Games web site was inaccessible, primarily due to the use of images without text descriptions. Some of these images contained important navigational information about the site which could not be interpreted by the text-to-speech software required to access computing and Internet information. After contacting SOCOG, Maguire discovered that were no plans to rectify the situation. As such, the issue regarding the inaccessibility of the web site was raised with the HREOC in early 2000. Maguire's argument was based largely on the premise that the inaccessibility of the web site breached Section 24 of the DDA of 1992, which stated that it is unlawful for a person, when providing goods, services or facilities to "…discriminate against another person on the grounds of the other person's disability…" (Carter, 2000). Maguire believed that the web site should comply with the W3C accessibility guidelines which would ensure accessibility to the required information (Refer to Appendix C for a full list of the guidelines).

After an examination of the W3C guidelines, the HREOC narrowed down the initial complaint to three specific requirements to be modified on the Olympic Games web site. The requirements were as follows:

1. that SOCOG include ALT text on all images and image map links on the web site
2. that SOCOG ensure access from the Schedule page to the Index of Sports and
3. that SOCOG ensure access to the Results Tables on the web site during the Olympic Games (Carter, 2000).

In response, SOCOG acknowledged the importance of such requirements but argued that the implementation of such requirements represented unjustifiable hardship, a concept discussed earlier in section 4.4. This argument was based primarily on the number of web pages that required changes, the cost involved and the short time left before the commencement of the Olympic Games. Specifically, SOCOG stated that due to the amount of data required for 37 sports and the number of databases that contained such data, it would be a difficult task to implement the changes. SOCOG felt that due to the "…6,000 pages and approximately 55,000 pages…" (Carter, 2000) that were to be generated from the "…1,295 templates…"

(Carter, 2000), it would be impossible to complete the changes prior to the commencement of the Olympic Games which at this stage were only a few weeks away. In response, Maguire indicated that the requested changes were relatively minor and as such, SOCOG would not need to create an entirely new site, nor purchase new infrastructure. Maguire also stated that whilst it would take one person a considerable amount of time to make changes, it would only take "a team of one experienced developer with a group of 5-10 assistants…4 weeks" (Carter, 2000) to complete the task.

After taking all the arguments into consideration, the HREOC came to the conclusion that SOCOG had "…engaged in conduct that is unlawful under section 24 of the DDA…" (Carter, 2000). As a part of this ruling, SOCOG was required to commence work on addressing the three previously listed points. After this directive was issued, SOCOG requested that the directive be issued instead to IBM due to the fact that IBM were contracted to SOCOG for the creation of the site and as such should be held responsible for the site deficiencies. This was rejected. HREOC held that as SOCOG employed IBM to create the site and as SOCOG provided IBM with the creative input and textual information, there was "…no sound basis" (Carter, 2000) for SOCOG to avoid the adverse finding. Although SOCOG remained responsible, it paid Maguire damages rather than actually modifying the Olympic Games web site.

In relation to this study, the *Maguire v SOCOG* case highlights the significance of the provision of online information, especially for people with vision disabilities. Despite having access to an AT product that allowed access to the Internet, the failure of SOCOG to provide access to online information resulted in the denial of information regarding the world's greatest sporting event to blind and vision impaired Internet users. The case also highlights the difficulties with the current legislative framework. As there is no specific IT-related disability policy, decisions are left up to the HRECO and lead to potential ambiguity in the ruling. Furthermore, although the ruling gained much attention, the fact is that SOCOG did not address the accessibility issues. The case also highlights the issues discussed earlier about the unjustifiable hardship part of the DDA.

Essentially, the SOCOG case presents a certain irony in that the victory of Maguire demonstrates the inadequacy of the current policy and legislative framework. Despite the HREOC decision, the web site remained unchanged and the accessibility issues were not corrected. The case suggests that there is a need to go beyond the provisions of the US Section 508 legislation. As indicated previously in section 4.4, Section 508 does not ensure that public information on non-public sites be presented in an accessible format. The SOCOG case demonstrates that there is a need for all information providers to provide access to people with vision disabilities.

5.4 Provision of online information by the media

The media are the most significant providers of information in society, far outweighing the government, even though government information is often, for people with disabilities, far more important. In order to identify how the media provide information to people with disabilities, interviews were conducted with representatives of the Australian Broadcasting Corporation (ABC) and the British Broadcasting Corporation (BBC). The ABC is publicly funded and is broadcast throughout Australia via television and radio and throughout the world via the Internet. The BBC, also publicly funded, is one of the world's largest broadcasters, spanning television, radio and online coverage worldwide. The BBC interactive division, also known as BBCi, provides a good comparison with the ABC. Firstly, both are publicly funded and are therefore required to comply with their respective government's accessibility criteria. Secondly, the BBC web site has the reputation of being one of the most accessible information sites in the world today and therefore provides a valuable comparison of the implementation of accessibility with the ABC. It was hoped that private media information providers could be included in this study, but efforts to secure interviews with the leading Australian provider NineMSN and US provider CNN were unsuccessful.

Media information providers perceive the Internet a little differently from large private media corporations. Both the ABC and the BBC believe that the most important aspect of the Internet is determined by the availability of information rather than the availability of communication. The ABC representatives indicated that the immediate access aspect of the Internet was highly beneficial to people with

disabilities, especially those who had difficulties buying a newspaper or going to shopping centres. The BBC representative agreed, stating that a recent study verified that the most important requirement for people visiting the site was the fact that information could be obtained at anytime.

Another significant difference was identified as the knowledge of AT. Both the ABC representatives and the BBC representative had a thorough understanding of screen reader and text-to-speech technologies and agreed that it was important to ensure that their sites were compatible with these technologies. The W3C Accessibility Guidelines, as outlined in Appendix C, were deemed to be of significant priority to both organizations. The ABC Internal Production Policy guidelines section 4.2 (Australian Broadcasting Corporation, 2003) states that:

> all Commonwealth organisations should meet the W3C's WAI (Web Accessibility Initiative) [Priority 1] checklist. Sites which don't comply are liable for potential legal action under Human Rights and Equal Opportunity Commission regulations, as was the case with S.O.C.O.G. during the Sydney Olympics.

Such policies demonstrate that the provision of accessible information is taken seriously by the ABC. The BBC has similar policies initially ensuring that text-based versions of all web site content is provided so that text-to-speech programs can easily access the information. This policy has changed slightly in recent times. The representative indicated that people with low vision would prefer to access the same information as the able-bodied population and view the graphical information wherever possible.

Media organizations have recognised that people with vision disabilities have the most difficulty in accessing information through the WWW. At the same time, they understood that people with vision disabilities could probably gain the most out of the new medium through the ability to access information instantly without the need to wait for information to be translated into a more accessible medium, such as translating print to Braille.

In terms of finding out what people with disabilities need from online information, the BBC has commissioned independent research in which four to five people from each disability group were asked about their requirements. The BBC also receives a significant amount of feedback from people contacting them directly with suggestions and improvements. The ABC has formed internal policies primarily on government policy decisions and landmark cases such as the *Maguire v SOCOG* case. The ABC representatives also acknowledged the accessibility work done at the BBC and often look to the BBCi site for guidance on how to relay media content to people with disabilities effectively.

The overall picture of how government, industry and the media are providing access to Internet-related technologies to people with disabilities is remarkable. Yet the issue of the digital divide for people with disabilities is arguably more prevalent and more significant today given our increasing reliance on technology. The next chapter will explore why, despite so much effort, the endeavours to prevent this 'disability divide' have failed and discuss the primary issues which surround the vital access of computing and Internet-related technologies by people with disabilities. As noted by the publicity surrounding the *Maguire v SOCOG* case, it is Internet web-based accessibility that tends to receive the most attention. Over the past 10 years the ability to receive information via the Internet has seen expectations increase with a continuing demand for knowledge. Terms such as 'Internet' and 'Information Superhighway' are common place, as is Internet Usage for the general population.

Yet despite the benefits of computers and the Internet as outlined in earlier chapters, the computing revolution is achieving the reverse for people with disabilities by increasing the depth of the disability divide. Society's increased reliance on technology has highlighted the widening gap between people with disabilities and the able-bodied population in terms of gaining access to technologies such as the Internet (Goggin & Mewell, 2003). The promise of information and the barriers that prevent access to that information suggest that it will be some time before people with disabilities are truly accepted into the mainstream online community.

In terms of the primary online information providers, there is a recognition that more needs to be done. The ABC representative acknowledged that its consultative processes do not generally involve proactive discussion with the general public but rely more on people with disabilities that have issues to come forward. When the interviews with ABC staff were conducted in June 2003, the ABC's web site did not meet minimal W3C accessibility standards despite the requirement for such compliance in their own production guidelines. The interviewees were deeply embarrassed about this situation and vowed to rectify the problem. The issue was addressed within days but it highlights the ease with which such problems can arise despite an organisation being committed to provide wide access to information.

The interview with the BBC representative indicated that changes were being implemented but that their original accessibility initiatives were now being used by others which resulted in slight embarrassment. For example, the BBCi site is now moving away from text-based equivalent pages in order to incorporate accessibility through the main pages of the site. Unfortunately, others who have looked to the BBC for guidance are now adopting text-based equivalents as a solution, believing that it is still what people need. The view of the BBC is shared by many in the blind and vision impaired community who want to have access to the same web pages as everyone else rather than have special arrangements (Royal National Institute of the Blind, 2003b). This again raises the importance of contacting users to find out what their needs are from technology before the implementation process.

Despite being deemed one of the world leaders in accessible information provision, the BBC commissioned a report in 2003 to assess their accessibility standards. The report found that there were a few areas where improvement could occur. These included creating procedures for a more uniform approach to sight-friendly graphical layouts, simplifying the language on the site and tyring to upgrade the site to Double-A W3C accessibility compliance (Harper, Kingsbury, & Hassell, 2002). This active approach is rare but demonstrates how continual revision and communication with those affected can assist in removing disability divide issues. Although the BBCi site continues to provide accessible information, the difficulties in gaining access to the Internet remain. A recent study observed a number of people with different disabilities trying to access online information with their respective AT

devices. The study concluded that the person who was blind faced significantly more difficulties due to difficulty in navigating around web sites that used frames and web sites with a lack of ALT tags (Hinn, 1999).

The occasional missing ALT tag or minor inaccessibility of information may not be deemed a big problem by the majority of Internet users but the disability divide has the ability to affect profoundly the way in which people with disabilities can interact in their community during a time of crisis. For example, many blind and vision impaired people living in New York during the time of the 2001 September 11 terrorist attack wanted to be kept informed of the situation and help people who were hurt by donating blood. Due to the inaccessibility of other web sites, the Visually Impaired Computer Users Group (VICUG) set up an accessible web site so that information could be gathered and distributed to the blind and vision impaired community (Mayfield, 2001). If it were not for the efforts of VICUG, people with vision disabilities at this time would have been effectively excluded from finding out valuable information during one of the most significant and tragic world events in recent history. Again, the desire to provide accessible online information to people with vision disabilities is being actively pursued but inaccessible web sites and multimedia information continue to contribute to the disability divide issue.

5.5 Conclusion

This chapter has demonstrated that the provision of information is vital in ensuring that people with vision disabilities have the same right to access information distributed by public and private organisations for public use. Such information can include government information, news and current affairs and other information deemed to be in the public interest. The policy framework that controls the way in which this information is dispersed through government agencies is designed to ensure equal access to all citizens, including people who are blind or vision impaired.

However, there are significant issues in providing government information to blind and vision impaired people and these issues directly contribute to the current disability divide. Despite Federal policies, such as the CDS and state-based policies, accessibility on government sites is still a hit-and-miss experience. The *Scott v*

Telstra and *Maguire v SOCOG* cases highlight the importance of accessible technologies in allowing access to communicating and information. In the case of the Maguire ruling, the case demonstrates the significance of providing accessible online information. It also provides an insight into the way in which the legislative framework is inadequate in providing for the current provision of online information. The media, who are also vital in providing information online, take a more active approach in providing accessible information. Although there are accessibility issues, corporations such as the ABC and the BBC work hard to ensure a level of accessibility within their information distribution. Given society's increasing reliance on multimedia and other visual aspects of information provision, it is likely that the provision of accessible online information will remain a struggle for people who are blind or vision impaired.

Given the accessibility issues present in the access of online information, it is left to the effectiveness of mainstream and AT products and services to address these concerns at a user level. Therefore, the final element in determining the broader issues of the current disability divide revolve around corporate policy and the effectiveness of current mainstream and disability-specific products and services. The next chapter examines the relationship between the provision of operating systems, software applications and hardware in relation to the disability divide.

6.0 THE PROVISION OF OPERATING SYSTEMS, SOFTWARE APPLICATIONS AND HARDWARE

6.1 Introduction

As outlined in previous chapters, the existence and severity of the disability divide is determined by the changes in society, policy and the effectiveness of computing and Internet tools and resources. As with changes in society and policy, few would argue that there are a number of products and services available to people with vision disabilities. However, the historical development of computing and IT suggests that these products are not always effectively addressing the challenges faced by blind and vision impaired individuals.

The purpose of this chapter is to identify the benefits and detriments of current and emerging technologies in relation to the welfare of people with vision disabilities. The corporations that are responsible for the provision of these products and services play a vital part in determining what products are available and how those products can be used to address the disability divide effectively. Much of mainstream technology is determined by a handful of multinational corporations. As such, the decision-making processes of these corporations are crucial in determining how people with vision disabilities can interact directly with both mainstream tools and disability-specific applications.

The identification of the corporate role in the disability divide is achieved through interviews with key multinational IT corporations, disability-specific AT providers and an examination into the types of products currently available and the impact of these products on people with vision disabilities. Such an investigation not only identifies the current issues but determines if the severity of the disability divide would be affected with the emergence of new mainstream computing and Internet technologies.

6.2 Mainstream corporate implementation of accessibility policy

Ultimately, responsibility for the development of accessible technologies lies with the designers and manufacturers of the IT products and services that sustain users' daily interactions with technology. The corporations which provide accessible technology can be separated into two categories: producers of mainstream technologies with accessibility features and manufacturers who develop AT-specific products and services. One of the major difficulties in determining the role of corporations is the phenomenal amount of information and misinformation about the various products and services available. There is also a significant amount of corporate marketing designed to portray a positive self image which does not necessarily accurately describe all benefits and weaknesses of their technologies. In order to determine effectively how the corporations perceive their role in the community, interviews were organised with the accessibility divisions of each major international corporation relevant to this study. Although it was anticipated that the interview responses would endeavour to emphasise their products and services in the best possible light, the interview process provided the best opportunity to ask questions that would allow for a new insight into issues surrounding the disability divide.

The six multinational corporations selected for this study were Apple, Cisco Systems, Hewlett-Packard (HP), International Business Machines (IBM), Microsoft and Sun Microsystems. Most of these companies are household names in the provision of home and business technology: Microsoft and Apple provide the dominant operating systems for computers worldwide and Sun significantly contributes to the UNIX GUI GNOME system. Cisco and HP were selected to permit the examination of network infrastructure and PC hardware design respectively. The selection of IBM was due to both its renown in the field of accessibility and because IBM was a leader in early accessibility development. These six companies also dominate the IT market. Microsoft and Apple, for instance, are often regarded as a duopoly in the commercially available Operating System (OS) market for the home user while Sun contributes significantly to UNIX-based development and is more relevant to business systems. Cisco dominates the

networking infrastructure market, while HP is the largest PC manufacturer in the world and IBM was one of the founders of the IT industry. These six companies are all listed on the US NASDAQ technology stock index and as outlined in Figure 6.1, represent a combined market value (NASDAQ, 2004) of a staggering $US678,325,800,000 or approximately $A900,000,000,000. As such it is fair to say that these companies have significant input in the provision of technology and their role in regards to people with disabilities is highly significant.

COMPANY	$US VALUE
Apple	21,401,800,000
Cisco	128,535,900,000
HP	60,839,600,000
IBM	158,221,900,000
Microsoft	292,040,000,000
Sun	17,285,700,000
TOTAL	678,325,800,000

Figure 6.1 Market Value of Interviewed Companies in $US (NASDAQ, 2004)

Representatives from these corporations viewed computing and the Internet as highly beneficial to the able-bodied population, but potentially even more so for people with disabilities. For example, the Microsoft representative indicated that he viewed the Internet as being highly beneficial in allowing people to pursue a wide variety of interests. The representative indicated that one of the specific advantages of Internet-related technologies from Microsoft's viewpoint to a person with a disability, is that once an individual is online, and has access to the correct AT equipment, having a disability is no longer an issue due to the equity of online interaction. Representatives from Apple had a similar viewpoint, believing that in addition to the provision of information, the communication aspect is rapidly becoming vital to people with disabilities. The Apple representative indicated that currently web access and e-mail access are the primary information and communication tools, but real-time chat is rapidly becoming a 'close number two' for people with disabilities, especially in the provision of disability-related support.

The representative from Sun took the view that vast quantities of information are "…available to massive amounts of people at the speed of light", significantly changing the way in which people with disabilities locate information. The view of Internet-related technologies from hardware developers HP was similar, with the representative indicating that the Internet is now affecting "every area of life" in its social, cultural and economic significance by adopting the e-inclusion philosophy of technology. The representatives from IBM also believed that the Internet is vital to people with disabilities, primarily as an information resource and, as indicated by Microsoft, it has the potential to be a great equalizer. The IBM representatives also suggested that the Internet is significant in allowing services to come to the user, highly useful to people with disabilities as they do not need to be concerned with difficult travel logistics due to the benefits of online communication and e-commerce resources. The consistency in responses confirmed that all of the multinational corporations that provide mainstream technologies genuinely believed that such technologies can support people with disabilities due to substantial benefits in the areas of information and communication.

When asked about which physical disability group the corporate entities perceived to have the most difficulty accessing computing and Internet-related technologies, all of the representatives agreed that blind and vision impaired people were significantly disadvantaged. Many of the corporations also indicated that they believed blind and vision impaired individuals currently face the greatest difficulty in accessing Internet-related technologies. To illustrate the point, the representative from Microsoft indicated that there were three significant barriers specific to people who are blind and vision impaired. Firstly there is an assumption that people can see the GUI. Secondly, the GUI is designed specifically for visual interpretation and it is difficult to convey its information in an alternative manner. Thirdly, the current computing emphasis is on multimedia, introducing technologies that are highly inaccessible to such people. The representative from HP shared this view, indicating that there are visual cues in virtually all computing and Internet-related products, some of which are minor whilst others are vital to the achievement of IT-related tasks. The representatives from IBM said that, unlike other disabilities, people who are blind or vision impaired face a situation where "…either the technology is accessible or it isn't." However, the IBM representatives also believed that if the

Internet were accessible, it could provide the most benefit to people with vision disabilities. This indicated that there was a belief that the Internet had the potential to be the best tool ever invented for blind individuals.

When asked about the need for improved access to computing and Internet technologies for people with vision disabilities, all of the representatives interviewed stated that their corporations had significantly contributed to the provision of accessible technologies. The Microsoft representative explained that the company's role was more about providing solid Application Programming Interface (API) modules which could then provide the framework for third-party manufacturers to develop fully-featured AT products. The nature of these products is discussed later in this chapter. The policy of Microsoft in this case is that the AT manufacturers are experts in the field and should be the ones creating the technology. However, Microsoft strongly believed in ensuring that people with vision disabilities should still be able to access information in environments where installation of appropriate AT devices may not be possible, such as when a computer is in a shared resource area such as a library. The Microsoft representative indicated that the provision of basic tools, in conjunction with API support for the creation of AT products, was an effective policy in ensuring that people who are blind or vision impaired gain access to mainstream technologies.

Apple has taken a significant step forward in the provision of accessibility. The Apple representatives indicated that unlike Windows, the APIs in Mac OS 10.x are completely accessible and therefore all applications developed on the Mac OS platform will automatically incorporate accessibility features if programmers choose to develop in the recommended manner. Apple considers its biggest contribution to people with disabilities as being the stability with which multimedia content can be viewed via accessibility tools. The Apple representatives explained that in many OS platforms, the use of a screen magnification program or text-to-speech engine often causes conflicts with multimedia presentations. For example, if a movie file is being run under Windows XP and a screen magnification program is launched, the AT product would not be able to magnify the movie. Under Apple's Mac OS 10.x, the Quartz graphics engine allows the internal zooming feature to magnify a movie without any disruption to the movie or the magnification program. Another example

of Apple's commitment to accessibility policy is its ability to update products, especially its ability to integrate new features. On the Windows platform, the accessibility features have remained virtually untouched for a number of years. On the Mac OS platform, the tools are constantly revised. The last two revisions of Mac OS 10.3 have seen on-screen alerts added to the screen magnification tool and the latest version to date, Mac OS 10.4, has introduced a text-to-speech application designed to provide access to Macintosh computers for blind computer users. The specifics of the accessibility tools included on the Mac OS platform are discussed later in this chapter.

Sun primarily sees its role as providing the programming tools in the Java programming language to ensure that any code developed results in accessible interface modules. According to the representative, Sun ultimately "…don't want the application developer to think deeply about accessibility" as it should occur automatically. The other area on which Sun is focusing is the development of accessibility tools in the GNOME GUI under UNIX-based Operating Systems. Unlike many other commercial entities, Sun liaises closely with the open-source development community to work collaboratively in the development of accessibility tools.

These responses indicated that the corporations were committed to producing tools and products which are beneficial to people with vision disabilities. It also indicated that there are many differing approaches between the corporations in how best to cater for the needs of people who are blind or vision impaired. However, as discussed earlier, such responses were anticipated as it demonstrates and actively promotes the success of corporations in assisting people with disabilities.

When asked about how each corporation determines the needs of people with vision disabilities, each corporation gave a slightly different answer. The Microsoft representative indicated that determining the needs of people with disabilities was primarily left up to the AT vendors as they are the experts in the area. The representatives at Apple discussed a number of resources including internal discussions with developers and communication with high-end users of their products. IBM had a similar approach in terms of online user groups, but also used

developer conferences as a good way to gather information. In terms of hardware-specific design, HP gathers most of its information through internal committees and ongoing human factor research. HP also consults with AT developers for similar reasons to Microsoft and looks at existing technologies which may be applied to people with disabilities. The HP representative used the analogy of how the Personal Digital Assistant (PDA) was initially designed for women as they did not want to carry around a big laptop, yet the technology had appealed to both sexes. The same 'accidental' applications can be applied to people with disabilities, particularly people with vision disabilities. Sun generally finds out what people need by speaking with open-source product users and with vendors at conferences.

It is this kind of response which indicates the biggest flaw in corporate policy. As discussed in section 3.4, with the development of travel aids and AT products, it is extremely difficult to produce products that will benefit people with disabilities unless there is some sort of formal consultation process. The responses from these corporations indicate that the corporations seem to have very little or no communication with people who are blind or vision impaired, effectively preventing them from determining exactly what it is that people with vision disabilities need from technology. Essentially, deciding what people need is done either internally or with users who are already dedicated product users. This results in companies guessing what people with vision disabilities need or running the risk of 'preaching to the converted' by only talking with blind or vision people who are already comfortable with the technology.

When asked about the difficulties in trying to communicate with people with disabilities directly about what they need from technology, all the interviewed corporate representatives conceded that it was a difficult process. The Microsoft representative indicated it was simply not their role to actively communicate with people with disabilities as this was left to the providers of AT who were experts in the field. The Microsoft representative also added that he believed enough was being done at an OS level to cater for people with disabilities, but agreed there was always room for improvement. The representatives at IBM acknowledged that they were deeply sensitive to the types of OS-based tools and AT technologies that were around to help determine gaps, but also conceded that they rarely had the opportunity to talk

directly with end users. The representative from HP explained that it was often a difficult process for companies to become motivated as people do not generally think about technologies for people with disabilities until they need them. This can extend to a corporate level. Furthermore, Reddy (2004) believed that there were other factors which prevented large corporations from exploring what people with disabilities actually need from technology. Reddy argued that it was costly to perform large amounts of testing in the marketplace and therefore little was done. In fairness, many of the large corporations have extensive beta testing programs but very few implement large disability-related product trails. Apple is one notable exception. It recently conducted worldwide testing of its VoiceOver module now integrated into Mac OS 10.4.

Another issue faced by multinational corporations is the employment of people who do not have any knowledge of the needs of people with disabilities but who are expected to create relevant products. When asked if people hired who had recently achieved tertiary qualifications had a good understanding of accessibility issues, all of the interviewees stated that they had no knowledge at all of the needs of people with disabilities. One representative from IBM expressed this by stating "I don't think they have a clue." It is therefore left to the corporations themselves to ensure that the programmer has a thorough understanding of issues faced by people with disabilities.

This lack of corporate policy regarding the need to directly communicate with people who are blind or vision impaired is a current major contributor to the disability divide on two levels. Firstly, it indicates that this lack of consultation is stopping people who know little about computing or the Internet from learning about the possibilities that mainstream computing products can provide. Secondly, the AT products created contain barriers which prevent those who are aware of computing and Internet benefits from effectively accessing information and communication resources.

6.3 Disability-specific product vendors' accessibility policy

As indicated by the multinational corporations, much of the AT development for people with vision disabilities was primarily left up to disability-specific AT vendors. The Microsoft representative, for example, stated that Microsoft worked with approximately 75 vendors to ensure that the APIs in Windows work well with the development of approximately 200 AT products. The HP representative also cited the importance of working closely with AT vendors, quoting the example of the PACMate by Freedom Scientific which was designed in collaboration with HP. Given that both Microsoft and HP perceived the developers of AT products and services as being the experts in the field of AT, it is important to understand if company perspective is different from the multinationals and if corporate policies are helping or hindering the disability divide process.

The AT company which was interviewed for the purpose of this study was Humanware, formerly PulseData, one of Australia's leading manufacturers and distributors of AT products and services. Humanware is an international company with its headquarters in New Zealand and its products include scanners, speaking dictionaries, Closed Circuit Television (CCTV) systems, magnification software, text-to-speech software and Braille displays. Humanware is renowned in Australia primarily for its development of CCTVs, the BrailleNote and VoiceNote organizations and the distribution of the ZoomText screen magnifier and the WindowEyes text-to-speech program within Australasia.

One representative at Humanware indicated that the company serves a niche market. As such, it is obligated to ensure that they operate professionally and ethically as most of their clients are people with disabilities. The representatives acknowledged that there is a need for a balance between providing the best possible service and remaining profitable. This view was evidence of the economic model-based perspectives showing that people with disabilities and the distributors of disability-specific products and services can come to a mutually beneficial and profitable arrangement. In relation to the benefits of computing and Internet for people with disabilities, the representatives of Humanware agreed with those from the mainstream multinational corporations that information and communication were

the two most important aspects of modern computing and Internet use. The representatives believed that the Internet will be particularly beneficial to the next generation who have tools such as the Internet integrated into learning systems, allowing the tools to be readily available in a way that is perhaps not so to the older generation. This response again confirmed that corporate policies which involve the production of new technologies are generally endeavouring to support people with disabilities.

The disability which was perceived as causing the most difficulties in using technology was vision impairment. One of the representatives indicated that the reason behind this view was due to the difficulties in converting data whilst retaining the original information. Such examples included the ability of computers to convert print into an electronic format and the conversion of Internet information into speech. Such benefits ultimately assist in providing more independence to people with vision disabilities, confirming the discussion earlier in section 2.5 about the importance of electronic-based information. This response highlights the importance of having effective AT products which easily provide accessible information to the user and allow for the conversion of inaccessible information to an accessible format.

One of the most important aspects of Humanware's development of AT products is its partnership with multinational corporations. The representatives talked primarily about the relationship with Microsoft who partners with them in the development of the BrailleNote and VoiceNote products. They believed that if a company like Microsoft has made a product that already reaches 95% of the population, Humanware should not have to dedicate time, money and extra resources just to cater for the remaining 5% who have a disability. This view confirms the Microsoft representative's earlier statements that accessibility products should be handled by AT specialists. The representatives indicated that it makes more sense for a professional organization that works specifically in the AT area, such as Humanware, to cater for that 5% and that it should be the responsibility of people who actually need those additional services to purchase them as required. The concern is that large multinationals could easily afford to develop AT tools but this would be an issue for two reasons. Firstly, large multinational corporations do not have the expertise to develop such tools. Secondly, there is a danger in having one

company which tries to do everything for everyone. This might stifle innovation, a critical element in the ever-evolving AT requirements.

One area where Humanware differed from the non-AT corporations was its way of finding out the needs of people with vision disabilities. The Humanware representatives indicated that employees talk directly with the various disability associations and the users of the products. Although the users are deemed to be the 'upper-echelon' of computer users, the feedback is valuable in the development of AT products. Conferences and internal discussions are also useful in determining the requirements of AT devices. On this basis, it would seem that Humanware is successful in ensuring that there is a consultation process with its clients in an endeavour to understand the needs. However, the corporate representative acknowledged that, like the mainstream multinational corporations, it struggles to communicate with those who have a disability and are not currently using company products. There is a reliance on various blind and vision impaired organisations to guide potential customers in Humanware's direction.

One of the greatest criticisms levelled at the policy of AT providers is the high purchase costs of their products. As discussed earlier in section 1.7, people with vision disabilities do not have access to much in the way of funding yet they are expected to pay a high price for AT products. Products such as text-to-speech programs and screen readers retail at approximately $A1000-2000 for the home user, meaning that an individual with a visual disability will effectively need to pay the price of two computers to have access to one.

Essentially, the policies of the AT product vendor Humanware focused on the economic model-based social categorisation in both the relationship between different corporations and the relationship between the AT provider and people with disabilities. The products and services available to people with vision disabilities provide improved, independent access to computing and the Internet whilst making profits for the company. The Humanware representatives perceive the role of the company as providing specialist expertise in a niche market and that larger corporations are only required to provide the framework in their products for such developments.

6.4 Corporate policies based on legal requirements

The development of products for people with disabilities is shaped in part by the legislative frameworks discussed in the previous chapter. All of the interviewed representatives of the corporations agreed that the current US legislative framework was extremely important to the development of accessible technologies for people with vision disabilities. The examination of corporate policy and US legislation was necessary to verify whether the effects of legislative implementation were supporting or hindering development for people who are blind or vision impaired.

In terms of complying with Section 508, the six corporations acknowledged that it was imperative to ensure compliance in order to obtain government contracts. Apple, for example, acknowledged that the Section 508 legislation motivated it to ensure that its APIs were accessible, yet representatives reported that the presence of Section 508 inspired them to go further than the legislative requirement, particularly in the multimedia development area. The representative from Sun further explained the importance of Section 508 by indicating that such policies ensured a certain level of accessibility. However, it is still up to the individual companies to fill in the missing pieces and go further than is required. Microsoft representatives also shared this view, explaining that it was often invited to consult with the US government on the creation of policy to assist in refining IT-related policy for people with disabilities. Cisco representatives believed that the legislation assisted in providing an e-commerce framework within the US Federal government which allowed for greater accessibility with the wider community as the company commenced branching into the home market.

One of the most crucial points regarding the impact of Section 508 was made by an IBM representative. The representative explained that Section 508 was very useful for development but even better as a policing mechanism as “people will do what you inspect, not what you expect” in terms of developing technologies for people with disabilities. Such legislation ensured that, at least in part, the ‘right thing’ was done by the corporations. The IBM representative also pointed out that the legislative framework was very broad, covering everything from the personal

user through to large networks and telecommunications. As such there was a certain degree of interpretation by the companies as to how to comply with the legislation. On this basis the responses confirmed that the US Rehabilitation Act of 1973, of which Section 508 is an element, has indeed had an impact in ensuring that corporations provide accessible functionality within products. However, the acknowledgement that much of the accessibility work was implemented as a result of Section 508, indicated that this was done more from an economic model point of view, ensuring that lucrative contracts with the US government could be maintained.

Therefore the next important issue was to confirm whether only the minimum has been implemented or whether the corporations had future plans to ensure improved accessibility beyond the Section 508 requirements. The examination of this issue revealed significant differences between the corporations in terms of future plans for the improvement of accessibility features for people with vision disabilities.

6.5 Products designed to assist people who are blind or vision impaired

6.5.1 Accessibility tools in mainstream operating systems

When addressing the needs of blind and vision impaired people in corporate policy and government legislation, it is important that an awareness of products and services are taken into account during the decision-making process. There are currently three major operating systems used regularly in the home and workplace. The most popular is Microsoft Windows, the current version of which is Windows XP. The second is Mac OS on the Macintosh platform, of which the most current version is Mac OS 10.4. The third is the UNIX-based platform Linux which features two major GUI environments, GNOME and KDE.

The Microsoft Windows-based OS platforms were notably lacking in accessibility features for the home user until the release of Windows 95 in 1995. Windows 95 introduced four key accessibility features. The first was the use of visual alerts for the hearing impaired, designed to appear in conjunction with standard audio alerts. The second accessibility feature was the ability to adjust the

mouse pointer. The mouse pointer could be adjusted in size, colour and shape. Windows 95 also introduced the MouseKeys option, allowing the use of navigation of the mouse arrow with the keys of the numeric keypad. The adjustment of the mouse size and shape was designed to assist people with vision disabilities whilst the MouseKeys feature was designed to assist people with mobility difficulties who find the use of a traditional desktop mouse difficult to manipulate. The third accessibility feature was the implementation of keyboard-specific accessibility tools. These included keyboard shortcuts for program access and Filter keys which allowed for adjustment of the length of time between when a key was pressed and when the OS acknowledged the key press. In addition, the speed in which keys could be held and repeated on screen could also be adjusted and the Sticky Keys feature allowed for multiple-key commands to be selected with one key at a time.

The final accessibility feature proved highly beneficial, permitting the adjustment of the Windows desktop itself. The desktop appearance could be highly customised either individually or with the supplied High Contrast colour schemes. The High Contrast colour schemes are designed to provide the maximum contrast through the use of white text on a black background as indicated in Figure 6.2, or black text on a white background. Font size adjustments can also be selected.

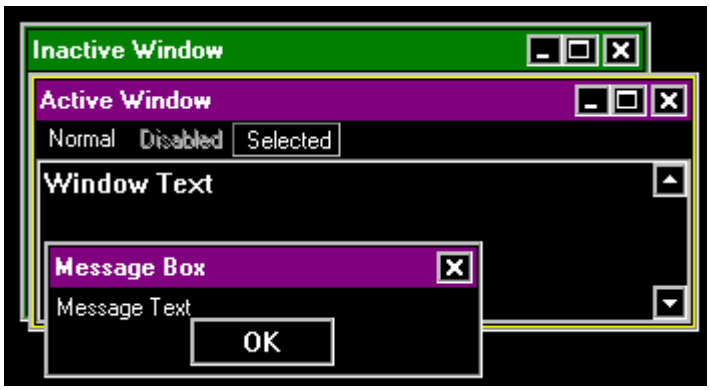


Figure 6.2 Sample of the High Contrast Black colour scheme available in the Windows OS since 1995

The Windows 98 OS platform, released in 1998, added some additional accessibility features. A wizard was provided to assist users in determining which accessibility features best suited the user. The most significant addition for people

with low vision was the addition of Magnifier, a tool which provided a magnification area at the top of the Windows screen. As indicated in Figure 6.3, this magnification bar followed the mouse arrow and would magnify the surrounding area.

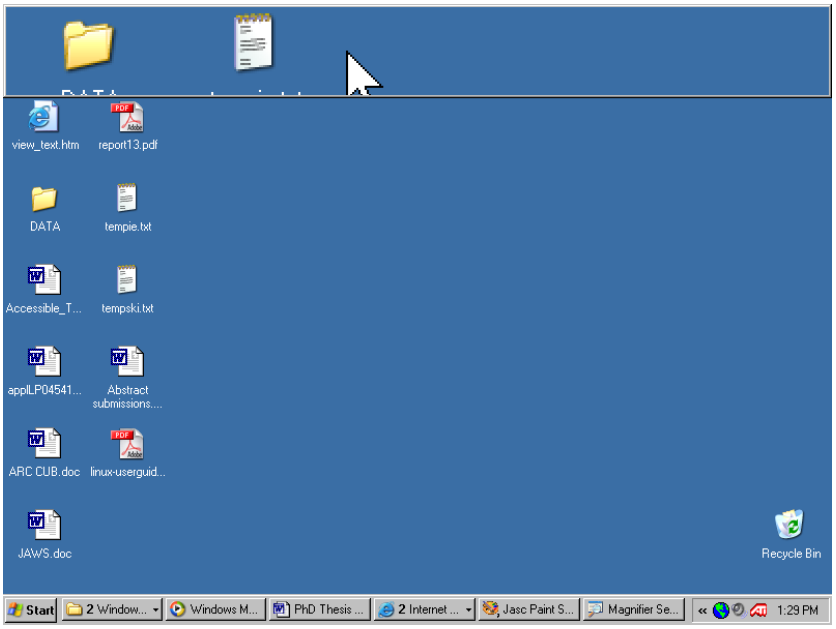


Figure 6.3 Magnifier program available in the Windows OS since 1998

Although the introduction of Windows 2000 to the business community in 2000 provided some additional accessibility features, they were not readily available to the home user until the release of Windows XP in 2001. Features included an on-screen keyboard for people with mobility difficulties and Narrator, a simple text-to-speech program with limited functionality.

The development of accessibility tools within the Mac OS platform was greatly limited until the release of Mac OS X, also known as Mac OS 10, in 2001. The traditional OS for the Apple Macintosh computer was completely revamped, becoming a UNIX-based OS. The evolution of this process heralded a significant step forward in terms of the provision of accessibility tools on the Macintosh platform. The first major change in Mac OS 10 was the provision of keyboard shortcuts to enable users who are unable to use a mouse effectively to achieve full access to the features of the OS. These shortcuts were also integrated into the application development routines of the OS to ensure that future applications could also be accessed by keyboard shortcuts.

Like the accessibility features in Windows-based platforms, the Macintosh products can be broken up into four categories: seeing, hearing, keyboard and mouse accessibility features. The initial release of Mac OS 10 featured similar keyboard options to Windows including Sticky keys and other keyboard customisation options. The mouse options were also similar to Windows, providing a variety of options for presenting the mouse arrow and MouseKeys to provide alternate access. Visual alerts were also included in the Mac OS 10 platform for the hearing impaired. The similarity between Mac OS and Windows demonstrated that, until recently, the accessibility of mainstream GUI platforms has been similar.

The main features that separated the Mac OS 10 platform from products such as Windows was the implementation of the magnification and speech facilities. Since the original release of Mac OS 10, there have been four major refinements resulting in vastly improved accessibility. Mac OS 10.2 provided a full-screen zoom feature, similar to the third-party products discussed earlier in the chapter. Additional keyboard shortcuts were also provided to adjust the desktop instantly, such as the ability to change to a high contrast colour scheme. The zoom feature has been further refined and in the current version of Mac OS, 10.4, it provides a stable fully-featured product incorporated into the operating system.

The other standout accessibility feature on the Mac OS 10.4 platform was the use of voice recognition and text-to-speech. The original release of Mac OS 10 featured benefits such as speech recognition for GUI navigation and talking alerts for speech output. The initial talking alerts and text-to-speech functionality was limited until 10.4 where the new fully integrated VoiceOver program was implemented. This endeavoured to provide full text-to-speech functionality into the OS. VoiceOver was similar to other third-party text-to-speech applications discussed earlier in the chapter but with the added benefit of being included in the operating system. Given the limited market share of the Apple Macintosh, it is expected that these additional accessibility products in the OS will increase the awareness of the Macintosh computer users and make it a more affordable and competitive choice on the PC market.

The UNIX platform has faced a difficult road in the path of accessibility for the home user. The nature of the UNIX OS, and in particular the PC-based Linux variant, relied heavily on the input of volunteers to develop accessibility programs. The other difficulty was that there were two primary GUI environments in the Linux OS: GNOME and KDE. Whilst there was some limited commercial support for GNOME from Sun Microsystems, development still lies primarily with the product's own user base. Both the GNOME and KDE interfaces provide limited accessibility functionality in the form of keyboard and mouse tools. There are also limited magnification programs and desktop modifications. In addition, several UNIX-specific applications, such as Dasher, have been developed to provide greater text input facilities to people with mobility disabilities. However, despite the attractiveness of using a freeware OS in an expensive AT environment, neither GNOME nor KDE at the time of writing provide the effectiveness or stability of accessible tools that are currently available for the Windows or Mac OS platforms.

The examination of these accessibility tools highlights the similarities and differences in the provision of corporate policy. The similarities between all three operating systems are the use of the GUI. As previously discussed, the GUI has a wide variety of advantages for the mainstream user but has disadvantages for people with vision disabilities. One of the most notable issues regarding the GUI is lack of experimental design. Most GUI environments have not undergone any fundamental changes in recent years. Microsoft Windows, for example, is similar today to how it looked in 1995 and the Mac OS interface resembles its original incarnation in 1984. It may be the case that the significant step forward that the GUI brought is now holding development back from further technological advance because new innovative designs could potentially remove the benefits that the GUI currently provides. In relation to the disability divide, a change in thinking would be highly beneficial in providing a more accessible computing environment. Yet it is unlikely that the implementation of a non-GUI OS will emerge in the near future. The tools which are automatically included in the OS of a computer system are examined with great interest in the hope that they will deliver the required technologies without having such a high price tag for additional AT products.

When providing accessibility tools, all of the corporations' representatives indicated that products go above and beyond the legal requirement for accessibility. The representative from Microsoft indicated that the corporation has a policy regarding accessibility development. The policy states that "…as our operating system and applications evolve, (they) will become more accessible. Every Microsoft employer must deliver on that commitment." The Apple representative indicated that the company only took six months to two years into the future for accessibility development, but believes its recent accessibility efforts with Mac OS 10.x reflect the effectiveness of this method of development.

However, the reality is that some corporations only provide minimal accessibility to comply with Section 508. Microsoft, which provides the world's leading OS, acknowledges that it has only put in minimal support so that the AT vendors can provide a fully-fledged product. The Magnifier program built into Windows XP, for example, provides a message:

> Magnifier is intended to provide a minimum level of functionality for users with slight visual impairments. Most users with visual impairments will need a magnification utility program with higher functionality for daily use.

The Narrator program contains a similar message. The Microsoft representative indicated that this is necessary due to its close relationship with the AT providers. Sapey (2000) views this type of collusion between the manufactures, the assistive technology providers and welfare agencies who distribute the technology as a significant part of the problem. This chain allows for organisations at every level to maintain control and profit from people with disabilities. In addition, the provision of comprehensive accessibility tools is extremely important when computers are being used in public places, such as libraries, where there are no opportunities to install custom AT products.

Microsoft in particular has been in some legal difficulties in recent times over its perceived inaction in delivering effective accessibility tools in its OS. Microsoft was widely criticised in 1998 by welfare agencies for releasing Internet Explore 4.0 which was inaccessible with most AT products. This was rectified shortly after with the introduction of version 4.01 (Barrett & LeDuc, 1998). Furthermore, at the time

of writing, Microsoft is being sued by US lobby groups because of fundamental accessibility flaws in its OS which are believed to be not Section 508 compliant. Microsoft accessibility director Madelyn Bryant acknowledged the oversight, which is particularly significant to people with vision disabilities and has vowed to rectify the problem (Royal National Institute of the Blind, 2003a).

On occasions when accessibility tools are effectively provided in operating systems, such as the change in mouse arrow size or colour scheme in most GUI environments, they provide a significant level of functionality to people with disabilities. As such it is interesting to note that there have been some significant movements in recent times in improving the accessibility tools within operating systems. Apple, for example, has introduced many new accessibility tools to its OS. Its fully featured screen magnification and recent text-to-speech programs have stirred much interest amongst blind and vision impaired people because it removes the need to purchase expensive AT equipment.

Although Microsoft's accessibility tools have remained unchanged for a number of years, the development team for the next version of Windows, to be known as Windows Vista, has mentioned that there has been a recent move to improve the accessibility of the API modules which is a promising sign for people with disabilities. In terms of the UNIX-style OS, the text-based interface can be made easily accessible, but the lack of support for the GUI interface, on which the OS is becoming increasingly dependent, means that UNIX could potentially become largely inaccessible.

As a result it can be observed that the OS development process itself also has a bearing on the level of accessibility. The policy of Microsoft Windows is very restrictive in allowing programmers access to the source code of the OS. The policy of Linux, on the other hand, has very few restrictions on access to the source code. The policy of Apple is a combination of the two approaches. It maintains propriety control on certain elements of the OS but allows open source development for much of the OS because of the UNIX-based nature of the product.

These different developmental processes appear to impact on accessibility in that the control of the source code in Windows makes complete integration of accessibility tools by third-party manufacturers difficult. The other end of the spectrum, complete open source, has also proved restrictive by making it difficult to maintain uniform and cohesive developments for AT products. The development approach by Apple appears to be providing an effective framework for ensuring that AT products and built-in accessibility tools can effectively support people with vision disabilities, although the limited user base of Apple products can prove restrictive. On this basis it can be argued that a mixture of open source and propriety development is the most beneficial development method as it provides more of an opportunity for consultation with people who are blind or vision impaired.

In essence, the lack of consultation with people who are blind or vision impaired, the desire to comply only with the minimal legal requirements and the economic model-based policy decisions have led to the world's most popular OS from being effectively accessible unless expensive AT products are purchased. Although it is encouraging to see developments in other OS products, there is still a need for fundamental GUI issues to be addressed to prevent continuing disability divide issues in mainstream products.

6.5.2 Hardware products

Generally, the only hardware input device used by a blind or vision impaired individual is a keyboard. The main reason for this situation is that the use of other devices, such as a mouse or a joystick, relies on visual cues to inform the user of a movement or action. The keyboard allows for both the input of text and the ability to navigate in a GUI environment through the use of keyboard shortcuts.

AT tools are available to assist those who are unfamiliar with the standard QWERTY keyboard layout, or prefer the use of a Braille keyboard. The Braille keyboard primarily relies on the use of six keys, each representing one of the six Braille cells contained within a character. Unlike standard text entry, keys on a Braille keyboard need to be pressed in synchronous combinations to generate characters. For example, pressing keys one and four will generate one Braille

character containing two dots. Braille keyboards generally consist of either an overlay placed on a standard keyboard, such as the Sixin, or are offered as a replacement to the standard keyboard. An example of this product is the Bach Braille Keyboard, produced by Wagner Technologies, as shown in Figure 6.4. It contains the standard six keys plus some additional control keys.

Figure 6.4 Bach Braille Keyboard (Abledata, 2004a)

For people with low vision, a number of large print keyboards are available. Large print keyboards generally maintain the standard QWERTY layout but may have larger keys or a large print lettering overlay. One example, featured in Figure 6.5, shows the Hooleon large print overlay on a standard keyboard.

Figure 6.5 Hooleon Large Print Keyboard overlay (Abledata, 2004b)

Braille printers, referred to as embossers, allow a computer user to print electronic information as a Braille document. Computer users generally have the choice of printing either directly from a Braille-based editing package or they can opt

to convert standard text into Braille. Although some embossers are able to print both text and Braille, most embossers will only print Braille, thus reducing the purchase cost of the item. Many embossers are able to print single- and double-sided by printing between the indents on the alternate side of the paper. Models of embossers include the ViewPlus Tigercub, the Enabling Brailleplace and, as featured in Figure 6.6, the Everest produced by Index Braille.

Figure 6.6 Everest Braille Embosser (Index Braille, 2004)

Another output device gaining in popularity is the refreshable Braille display. The Braille display works by moving pins up and down to create Braille characters. These characters represent on-screen text information. Although many Braille displays are limited in the number of characters they can represent, newer models are able to translate the text into recognised Braille characters which can represent multiple letters. Models of refreshable Braille displays include the Braille Voyager, the Alva BrailleTerminal 320 and the Vario 80 produced by Baum Retec AG as demonstrated in Figure 6.7.

Figure 6.7 Vario 80 Refreshable Braille Display (Abledata, 2004c)

Hardware voice synthesizers are another output AT device, once the only source of text-to-speech output available to blind and vision impaired computer users. Improvements in speed and processing power of modern computers have now led to most users opting for a software-based solution. However, many people with vision disabilities still prefer hardware-based synthesizers because of the clarity of voice and the reliability of the product. Such products work by converting a graphical data stream into a text stream and outputting it to the hardware device. The user then hears the text equivalent of the graphical information that would normally viewed on the screen. Popular models include the DECTalk and the Artic Transport as featured in Figure 6.8.

Figure 6.8 Artic Transport Voice Synthesizer (Artic Technologies, 2004)

The hardware devices available for blind and vision impaired users are generally separated into two categories: input devices, such as the Braille keyboard and output devices such as the Braille printers. The difficulty with this type of AT is that the interaction between the input and output devices is not simultaneous. People without vision disabilities rely heavily on simultaneous feedback to grasp the significance of their actions and movements, such as the relationship between the movements of a mouse being output of that moment to a screen.

In order to provide equivalent functionality to blind and vision impaired computer users, a variety of haptic devices have been created, some of which are still in the experimental stage of development. Haptic devices, or tactile devices as they

are also known, rely on the sense of touch to provide instant feedback when a task is performed by a computer user. The common computer mouse is one tool that has been examined as a possible haptic enhanced method of interaction for blind and vision impaired individuals. Models range from a vibrating mouse which reflects sounds in multimedia applications to devices which attempt to represent a screen display in tactile form. Haptic mice can be divided into two categories: mice with mounted tactile displays and force-feedback mice that simulate objects and textures.

Force-feedback mice are similar to the commercially available force-feedback joysticks in that they use a vibration or pressured feedback system to inform the user of an action. The tactile haptic mouse, such as the VTPlayer from VirTouch as noted in Figure 6.9, has two 16-pin displays, similar to those on a refreshable Braille display. These pins are mounted where the user's first two fingers sit on top of the mouse. The feedback from these pins provides a tactile representation of the screen environment under the cursor.

Figure 6.9 VTPlayer VirTouch Haptic Mouse (VirTouch Solutions, 2004)

Another type of haptic device that has recently gained support in the marketplace is the Omni Phantom produced by SensAble Technologies, as featured in Figure 6.10. The flexibility provided through the spatial and orientation exploration with six degrees of freedom has proven to be of interest to researchers. In particular, these devices can present the perception of virtual haptic environments. The Phantom is a commonly used device in this category. An example of the potential use of such a device was presented in the format of making mathematical graphs accessible to people who are blind or vision impaired. Although potentially beneficial, all haptic devices providing spatial and orientation degrees of freedom are expensive and not currently available for mainstream use.

Figure 6.10 Omni Phantom (SensAble Technologies, 2004)

Tactile graphics tablets have also received much attention as a method of conveying information from a visual monitor in a non-visual form. They usually consist of a large rectangular set of pins which can be raised and lowered like those in a refreshable Braille display. However, other approaches have used vibrating pins or plastic bumps. Shaped memory alloys have also been used in the construction of tactile graphics displays. An important benefit of tactile tablets is that they often support multipoint interaction like that in the real world. That is, objects can be felt with all fingers of both hands, rather than with the point of one stylus or by the movement of a mouse. It is also highly useful in conveying spatial concepts such as the height of graphs and the measurement of distances. This allows maximum use of the restricted bandwidth available to the sense of touch. Tactile graphics tablets are still experimental and are not currently available in the commercial marketplace.

Portable note-taking devices are also useful in providing portable computing technology to blind and vision impaired users. Similar in functionality to a PDA and in many cases running the same Operating Systems, portable note takers provide office productivity tools such as word processing, contact management and Internet facilities. The input is generally via either a standard or Braille keyboard. As the device is for blind or low vision users, the output is audio speech rather than a screen display. Examples of electronic note takers include the PACMate by Freedom Scientific and the BrailleNote as seen in Figure 6.11. The BrailleNote also incorporates a refreshable Braille display, wireless and GPS technologies.

Figure 6.11 The BrailleNote PK (Humanware, 2004)

6.5.3 Software products

Software products are vital in ensuring that people who are blind and vision impaired can access mainstream technology. Software applications play an important role in supporting hardware AT devices because they provide an effective method of translation which ensures that visual information is correctly entered into a computer. Software applications also ensure that information is effectively directed to the user. The main categories of products are Optical Character Recognition (OCR) software and voice recognition software.

OCR is the method in which scanned pages of text are converted into electronic text documents (San Diego State University, 2004). The OCR process is not in itself considered AT due to its mainstream applications but there are several software applications available which can directly translate a scanned document into a text stream thus making it available for text or voice output. The software focuses on obtaining audio-friendly elements of the document to ensure clarity for voice output options. Examples of AT-specific OCR software include OpenBook produced by Freedom Scientific and Kurzweil produced by Kurzweil Educational Systems.

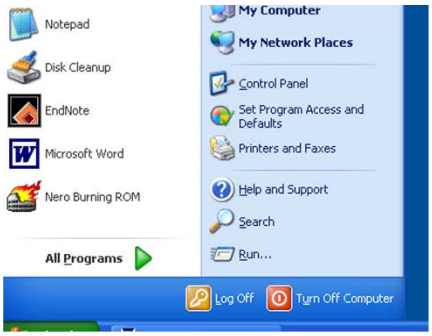
Voice recognition software is another mainstream product that has been adapted to assist people with disabilities, particularly those with spinal cord injuries or vision disabilities. The software is designed to interpret the spoken word and translate it directly into text. Although this technology is still being refined due to variances in pronunciation and the inconsistencies found within many languages, many specialist products are now available. These products include Dragon Naturally Speaking by ScanSoft, ViaVoice by IBM and I-Say by T&T Consultancy. In

addition there are other input-based software applications that respond to voice including voice-activated web browsers and voice-activated calculators

Software output-based products are often deemed to be the most essential of all the AT products available for blind and vision impaired computer users. The reason for such importance is the visual nature of the GUI. The inability to observe a graphical environment on a computer screen display with ease means that alternative output methods need to be developed. There are an assortment of output products available with the most popular being either screen magnification software for low vision users or text-to-speech systems for those who are blind or have severe low vision.

Screen magnification software is designed to enlarge the GUI by 'zooming in' into a particular section of the graphical environment. There are a variety of different magnification techniques offered by magnification programs depending on the needs of the user. Most magnification programs focus on providing a full screen zoom, as outlined as shown in Figure 6.12. A full screen zoom enlarges a small area of the screen and allows the user to scroll around the other areas. Most programs provide magnification ranges from slightly above non-zoom levels through to 16x magnification.

Other magnifiers may split the screen, keeping part of the GUI environment the same size and another part of the GUI magnified. Others operate by providing a magnifying 'ruler' or 'glass' as indicated in Figure 6.13, which can be moved over different areas of the screen to provide minor magnification. Popular screen magnification programs include ZoomText produced by AiSquared, MAGic produced by Freedom Scientific and Magnus produced by Sensory Software.



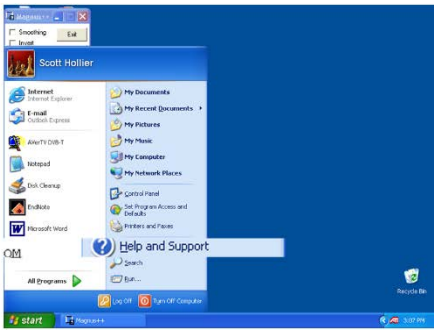


Figure 6.12 (left) Example of full screen 2x screen magnification in Windows XP

Figure 6.13 (right) Example of 'ruler' 2x screen magnification in Windows XP

Screen reader software is designed for people with severe vision disabilities. The software performs a two-part process, firstly converting the GUI environment into text and then secondly outputting the text as audible information. Most screen reader software is programmed to take an intuitive snapshot of the GUI and output the most relevant information. To achieve this result, screen reader programs generally have different software scripts for different applications so that the software can immediately determine the information most relevant to the user. Unlike other AT software programs, screen readers assume that the user cannot see a mouse point and therefore all input will come from keyboard shortcuts. The voice used to convey the information can generally be altered in pitch, tone and speed to ensure comfort for the user. Popular screen reader programs include JAWS produced by Freedom Scientific, WindowEyes produced by GW Micro and Lookout produced by Sensory Software.

In addition to specific input and output software applications used to provide accessibility and functionality for blind and vision impaired computer users, accessible versions of general applications such as word processors, calculators and web browsers have also been released. One example of the products available is the Braille translating software package from Duxbury Systems, a Braille equivalent of a Word Processing application. Another popular product is a program called Home Page Reader, produced by IBM, which converts the output of a web page into speech. There are also numerous large-print versions of fonts which can be used in standard word processors and calculators featuring large print buttons.

HP, Cisco and IBM have all contributed to the development of AT products. The HP representative sees the company's role as going for "the sweet spot of the market…people with disabilities are not 'one size fits all'…" so it is imperative that the technology matches the individual needs of users. HP have spent much time ensuring that its hardware devices can be accessed by people with disabilities, such as ensuring that all HP laptops can be opened with one hand. The HP representative used the analogy that HP builds an accessible house so that others can put individual AT needs inside it.

Cisco has primarily contributed to the needs of accessibility through the provision of its educational program. The Cisco Certified Network Administrator (CCNA) course, used by students worldwide, has a trial course at Curtin University of Technology. It is called the Cisco Access for Vision Impaired (CAVI) project and it is designed specifically for blind and vision impaired users. The Interface for Cisco networking and routing equipment uses a text-based Command Line Interface (CLI) OS, allowing for easy translation into a text-to-speech engine or allowing the modification of text and colour size. This makes the course a good opportunity for people with vision disabilities (Murray & Armstrong, 2004).

IBM has produced significant contributions in the field of accessibility. As one of the pioneers of the IT industry, the representatives explained that IBM has endeavoured to include accessible APIs for many years exemplified by the design of OS/2. In recent times, IBM has stepped away from focusing on in-house AT development for the mainstream marketplace but continues to focus on the development tools in niche areas where such are not currently available. For example, the development of Home Page Reader allows text-to-speech functionality when navigating the World Wide Web on a UNIX platform where accessibility tools are still limited. The representatives summed up IBM's position by indicating that it is also aiming to fill in the gaps in AT and to provide tools at affordable prices.

For the most part though, the AT products listed are manufactured by AT-specific companies. Even AT devices themselves can pose problems which contribute to the disability divide. There is often a perception that once a person with a disability has received an AT product, all problems are immediately solved.

AT often fails when there is not enough time dedicated to ensuring that the AT device receives the correct support. There are three areas which are vital in ensuring that an AT device is going to be effective.

Firstly, there are the factors related to the people who are supporting the use of the AT product. This includes the evaluation and testing of the product, providing support and training, determining the practicalities such as funding, service and delivery and cultural factors. The second group of factors relate to the AT user. The device needs to match perfectly the user, the age of the person, literacy skills, gender and ability to use. The third group of factors revolves around the device itself. This includes the attention to essential human factors, design, mechanical safety, durability, power consumption and reparability (King, 1999).

Ironically, it is also possible to give too much support to the use of AT devices. Dorman (1998) suggests that in order for AT to be truly effective in an educational environment, an evaluation team must be assembled for each student. This team must consist of the student, teachers and appropriate design professionals. Input must be considered by the user, a focus of the AT functions must be determined, the advantages and disadvantages must be carefully considered and after an analysis of all products, a device can be obtained. Unfortunately, personal observation and conversations with many other students with disabilities suggest that by the time the meeting has been coordinated and evaluation completed on the appropriate product, too much time has passed in the course for the eventual choice to be useful. It is important to strive for a balance between the analytical approach to AT and real-world time constraints.

In addition to cost and the time for implementation, AT devices are also criticised for their design. For example, the PACMate, developed between HP and Freedom Scientific, runs the same OS as other PDA systems but it is very large in comparison to the equivalent pocket-sized devices. When the HP representative was asked about this issue it was suggested that it is significantly cheaper to keep AT products large. Given that they are already so expensive, it is important that costs are cut wherever possible. When the issue of the cost of AT was discussed with employees of Humanware, the representatives confirmed that it is likely that only the

‘upper-echelons’ of users would fully understand the process and cost faced by people with disabilities but denied that there was any conspiracy indicating that such a small market resulted in high prices.

Essentially, the provision of AT products is often successful in proving access to mainstream technologies for people with vision disabilities. However, the complexity in using the products, combined with the cost, often makes these products prohibitive to most blind and vision impaired computer users.

6.5.4 Internet tools

There are a number of online services and resources available to assist in the creation of accessible web sites. There are also a number of support services in the form of online information, chat rooms and mailing lists which provide people who are blind or vision impaired with the opportunity to share experiences and seek advice about their disability. There are many online tools and services available to assist people who are blind or vision impaired. One of the major uses of the Internet is locating information about related medical conditions and accessing other web sites and information relating to AT products, training, employment, books, magazines and medical resources. Yet the benefits of the Internet extend further than just disability-specific information. The availability of mainstream information on the Internet has provided unprecedented opportunities for people who are blind or vision impaired. As indicated earlier in sections 2.3 and 2.5, people with vision disabilities were greatly restricted in gaining access to information due to the inability to access material in libraries and other printed medium. Through the use of AT, such as screen magnification or text-to-speech software, Internet pages provide a wealth of information to people who were previously unable to access this information.

In order to check web sites for W3C compliance, there are a number of validation tools available either for download or via validation web pages. Examples of these tools include WebXact, formerly known as Bobby from Watchfire and ADesigner from IBM. The WebXact web site, located at http://webxact.watchfire.com/ provides a limited free portal to test web pages. Once

a web page has been tested, a report is issued outlining the three W3C accessibility guideline Priority levels and any issues that need to be repaired to ensure compliance. ADesigner, recently released by IBM, incorporates a number of tools into one validation package. In addition to testing a page for W3C compliance, it also allows for a variety of visual simulators so that people with good vision can experience a web page in a similar fashion to a vision impaired individual. ADesigner also examines how successfully the page could be read by a text-to-speech program and how easy the site would be to navigate. Figure 6.12 demonstrates the use of ADesigner on the Curtin University home page.

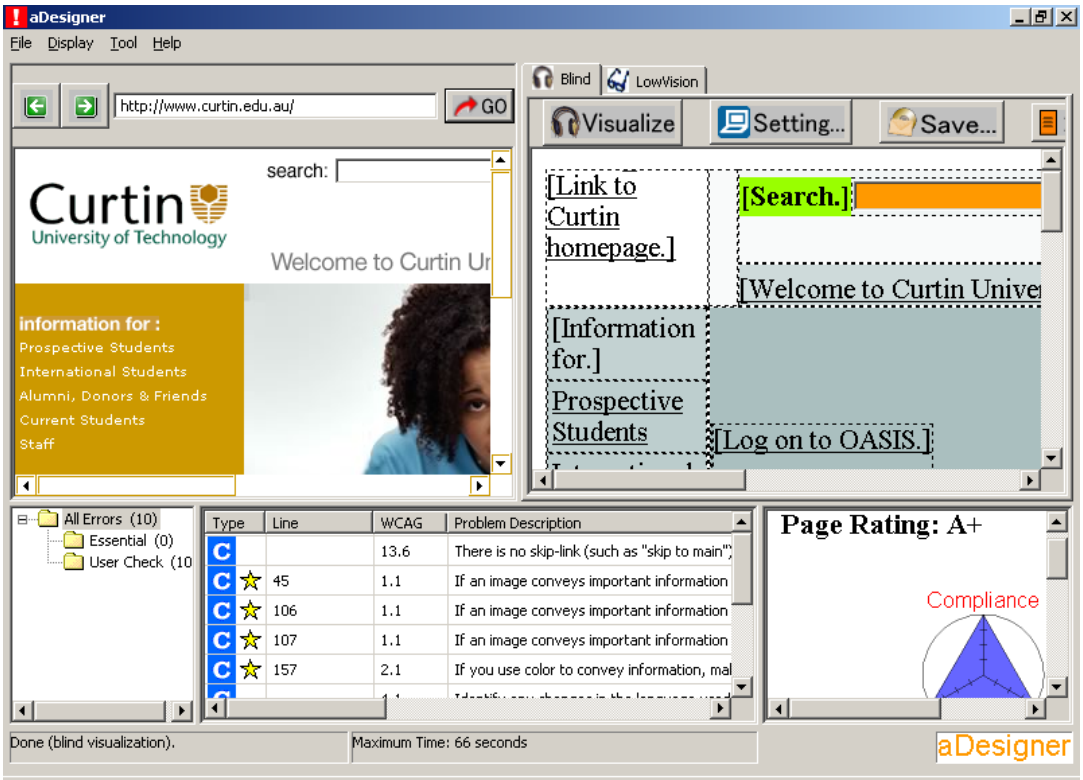


Figure 6.12 IBM ADesigner validating the Curtin University home page

As discussed earlier in section 2.5, the other significant benefit of the Internet to people with disabilities is the ability to gain support from other people with similar medical conditions. These support services can come in several forms including mailing lists, chat rooms and messenger services. Web portals are also commonly used to provide information and communication to people who have been recently diagnosed with a visual disability. In Australia there are a variety of services available. General information and further links to resources can be found at sites

such as Vision Australia located at http://www.visionaustralia.org.au, Retina Australia http://www.retinaaustralia.com.au, and other various blind and low vision associations. In terms of communication, the VIP-L mailing list is for Australians who are blind or vision impaired. http://www.hicom.net/~oedipus/blist.html#vip-l. Organisations such as Blind Citizens Australia have an online presence and can be located at http://www.bca.org.au. Real-time chat can be found for a variety of different vision disabilities. One of the most popular web sites featuring information for online chat is the Dee's Wonky Window web site, available at http://www.netserv.net.au/doonbank/dee.html.

The examination of Internet tools and resources indicates that there are a number of products available to assist blind and vision impaired people. It also demonstrates that there are a lot of resources available to government and corporations to ensure accessibility of their own online information. Yet despite these resources, corporations acknowledge that it is very difficult for people with vision disabilities to access resources on the Internet.

The Microsoft representative acknowledged that it is much harder for a person with a disability to get online, especially someone who is blind or vision impaired. He indicated that finding information online can be "…like a swamp" at times, a concept confirmed by the Sun and IBM representatives who indicated that one of the biggest difficulties is determining the reliability of information. The Sun representative also felt that the inaccessibility of web site and cost were big factors and the Apple representatives believed that the GUI was still one of the major stumbling blocks. However, all of the representatives denied that the companies are in any way contributing to this difficulty. Instead, they indicated that the companies are providing products and help in solving accessibility difficulties.

In order to understand further the importance of providing access to people with vision disabilities by the mainstream technology providers, checks were done prior to the interviews regarding the accessibility of their own corporate web sites. The checks were personally performed in June 2003 for W3C Single-A compliance. The sites have also been checked regularly since this date. The web sites of Microsoft and Apple both failed to meet even the minimal guidelines. When

interviewed about the W3C guidelines, all the representatives indicated that it was important but most agreed that it was no more or less important than other policies. When Microsoft and Apple representatives were confronted about the inaccessibility of their own sites, both vowed to rectify the problem. Apple rectified it almost immediately and Microsoft rectified their home page after six months. However, a vast number of web pages are still not meeting the minimal W3C standards. All other companies are currently meeting the W3C minimal accessibility standards. This result again strengthens the argument that the disability divide is caused by issues which are largely preventable. The creation of accessible web sites would greatly assist access to the Internet and it should be a standard requirement for corporate web sites to meet even the minimal WC2 Single-A compliance.

Interestingly, none of the representatives who were interviewed perceived their own actions as being a contributor to the disability divide. Given the difficulties faced by people with disabilities in accessing computer and Internet-related technologies, it is interesting to note that all of the interviewed representatives either did not perceive the disability divide to be substantial or did not believe that it was an issue. All representatives cited examples of people with disabilities who were able to use their products or people who worked for the company who were able to use their products effectively.

6.6 Conclusion

This chapter demonstrates that multinational corporations play a major part in shaping the way in which computing and Internet technologies are presented to the mainstream population. In relation to people with disabilities, there are two main factors which control the accessibility of a product: the level of dedication in corporate policy to helping people with vision disabilities and the design of the product itself.

The data collected for this chapter suggests that there is a level of dedication in trying to provide products and services to people with disabilities effectively. There is an acknowledgement that people with vision disabilities face particular hardship in gaining access to current computing and Internet technologies and

internal policies reflect the need to provide this technology. Generally speaking, there is a corporate aim towards a 'level playing field' and the belief that in the future, people who are blind and vision impaired will have equal access to products and services.

However, the formation of internal policies and the implementation of products are not effectively catering for people with vision disabilities and as such are directly contributing to the disability divide. This is due in part to the fact that corporations only implement the minimum requirements as indicated by US law. Another factor is because the provision of particular technologies which are largely beneficial to the mainstream population, such as the GUI, have turned out to be highly detrimental to people with vision disabilities.

The greatest problem, however, is the fact that most of the mainstream corporations have little consultation with people who are blind or vision impaired at the grass-roots level. This lack of a policy which could ensure consultation is resulting in either products being developed for the small minority who have embraced a particular product, or products which do not cater for the needs of people who are blind or vision impaired. Essentially, both the policy and product elements of technological provision are contributing to the disability divide. Although there are efforts being made in some areas to address this issue, it is likely that the recurring pattern of the disability divide identified earlier in chapter 3 will continue if consultation with those affected is not effectively established.

7.0 SURVEY METHODOLOGY AND FINDINGS

7.1 Introduction

Previous chapters have identified the existence of the disability divide and shown that government policy, corporate policy and the effectiveness of computing and Internet-related technologies all affect this divide. However, one key factor shared between all factors of the disability divide is the lack of consultation with those affected; people with disabilities and in particular, people who are blind or vision impaired.

In order for this thesis to examine effectively all causes of the disability divide, it is necessary to delve deeper into why this lack of consultation has contributed to the disability divide. In order to give blind and vision impaired people a voice, a survey was conducted amongst blind and vision impaired people across Australia in order to learn about the experiences of this disability group in relation to computing and the Internet. By learning about such experiences, it is possible to find out their needs from such technologies. By addressing these needs, issues contributing to the disability divide can also be addressed. This aim of this chapter is to report the methods and findings of this unique and substantial survey designed to discover the other factors which need to be rectified in order to address the disability divide effectively.

7.2 Method

7.2.1 The need for a broad survey

It is apparent to this researcher, on the basis of secondary research, that blind and vision impaired people were not receiving the same access to computing and Internet-related technologies as the able-bodied population. As discussed earlier, the changing social category of disability resulted in the adoption of different social models at different times. Although the benefits and detriments of these points of history are open to debate, one thing that is clear is that people with disabilities were rarely given the chance to voice their own concerns; policy was often created as a

result of a popular model and in turn enforced by the same created policy. During the same time period as this rapid social change, information technology provided many new opportunities for people with disabilities, especially people who are blind or vision impaired. As previously discussed, such products not only provided the same benefits as the mainstream population, but also provided disability-specific benefits through elements such as independent information access and disability-specific online support.

Yet clearly, despite such significant IT benefits, people who are blind and vision impaired are not embracing computing and Internet-related technologies at the same rate as the able-bodied population. As noted in earlier chapters, issues of poverty, high unemployment and a lack of educational opportunities are particularly difficult for people with vision disabilities, more so than other disability groups. Such issues make it more difficult to gain access to IT and services in general. However, in addition to these identifiable barriers, there is a complex relationship between policy and legislation, the provision of online information and the corporate provision of AT products which, as demonstrated in chapters 2 and 6, has a significant impact in determining the level of access a blind or vision impaired individual has to computing and Internet technologies. As outlined earlier in chapters 4 and 5, the way in which policies are created and implemented have a profound impact on the access to information. As highlighted earlier in sections 4.4 and 5.3, there are many examples where such policies are inadequate in addressing potential inaccessibility issues.

Yet although there is complexity in examining the disability divide, there is a common link between the historical, social and technological frameworks; the role of the people. Historically, there was little or no consultation with people with disabilities when determining how best to cater for their needs. The creation of policy and legislation by able-bodied individuals again denies the opportunity for the people affected to voice their concerns. Furthermore, in the development of computing and Internet-based technologies, there is a notable lack of consultation with people with disabilities which has directly resulted in the denial of basic services. The current legislative framework does not appear to support people with disabilities effectively when issues arise and the current corporate climate indicates

that companies are endeavouring to cater for people who are blind and vision impaired yet fail, for the most part, to achieve genuine benefits.

Clearly, there is a significance argument to state that in order to cater effectively for people with disabilities, it is necessary to identify their needs by asking the people directly. In the context of this study, a survey instrument is the best way to achieve this examination. A broad survey allows for many different experiences of computing and Internet use to be examined and establish what the needs are of people with vision disabilities. Such needs can then be examined to determine which issues are currently not being addressed and the resolutions of such issues can be used to resolve the current disability divide.

The survey instrument provided both qualitative and quantitative data. In order to examine the thoughts and views of blind and vision impaired people, it was necessary to undertake a qualitative approach. However, the very nature of the disability divide indicates that different people have significantly different views regarding access to computing and Internet-related technologies and as such, a quantitative component was required for a comprehensive comparative analysis of differing user experiences.

To this end, a survey was selected on the basis that this structure was deemed to be one of the most important methods in measuring applied societal research when trying to obtain a large number of viewpoints (Trochim, 2002). Unlike the interviews with government and corporate entities, this part of the study used numerous opinions from a wide range of individuals as opposed to the selected opinions of experts. It was therefore decided that a questionnaire-style survey would be the best approach for obtaining a large sample.

7.2.2 Survey design

The survey design was based on the examination of the established study objectives. The study objectives were as follows:

1. to demonstrate the ways in which Internet technologies provide advantages for people with vision disabilities
2. to develop a clear understanding of the ways in which people with vision disabilities perceive and utilise Internet technologies in relation to self, establishing the extent and nature of perceived barriers or benefits
3. to investigate and determine the effectiveness of Internet-related products and services available to assist people with vision disabilities
4. to determine the effect of government policy and corporate initiatives on the issues surrounding the disability divide and
5. to propose solutions that will help close the disability divide in relation to Internet use and access between people with and without a disability.

The questions were separated into five sections within the survey. The sections were as follows:

- Section A, Personal information
- Section B, Computing and Assistive Technology knowledge
- Section C, Internet knowledge
- Section D, Government and Corporate views and
- Section E, Comments.

In relation to the objectives, sections B and C were primarily designed to elicit information from a user perspective about how computing and Internet technologies can assist people who were blind and vision impaired. The second objective was addressed primarily by sections C and D, which determined the relationship between online tools and resources to the overall needs of people with vision disabilities.

The third objective was addressed by a combined comparative analysis of all sections. The fourth objective was largely determined by section D and the final objective was developed through conclusions drawn from all five sections. The final section provided an additional opportunity for blind or vision impaired people to express any concerns not addressed within the survey questions.

Within each section there were questions that were designed to allow an individual comparison of elements at using both intra-section analysis and cross-tabulation analysis. The questions chosen in each section represented specific information established in the earlier chapters of the thesis to gain a better understanding of what people with vision disabilities needed from IT and, in turn,

complete the objectives of the thesis. A complete list of questions contained in the survey instrument can be found in Appendix B.

Section A, personal information, consisted of ten questions, each relating to personal data about the survey respondent. These data were vital in providing information on the effects of established disability divide factors and also in detecting the impact of other personal factors. The first topic explored was the issue of age. The age of an individual was of particular significance as the use of computing and Internet technologies varies significantly depending on the age of an individual. Location and gender information is also important in determining if location or gender affects the results of the study. The data also provided a basis for detecting bias in the sampling as the gender responses should be equal and the location data should be evenly spread across Australia. Another theme within the use of personal information was in regards to an individual's living arrangements, designed to determine if assistance was available within the house. The rate of employment and income amongst the respondents were additional items. Given the established factors of poverty and unemployment amongst people who were blind or vision impaired, it was important to determine the extent of these factors in the prevention of access to computing and Internet-based technologies.

Another major focus regarding personal information was to determine the level of eyesight held by the surveyed individual and the type of condition faced by an individual. As many AT devices cater for people who are either blind or vision impaired, it would suggest that these groups have significantly different needs from computing and Internet-technologies. As such these questions were designed to determine if this was the case. The final focus of Section A was to determine the education levels of the individual. The questions were designed to determine if the previous or current educational levels of a blind or vision impaired individual affected their ability to access computing or Internet-related technologies. In essence, these questions were designed to determine if there were non-technical issues which were leading to experiences which contribute to the disability divide.

Section B focused on the use of computing and associated assistive technology products by respondents. This section was used to determine the ease in

which computing and AT could be used and the effectiveness of such tools. The initial questions were designed to determine familiarity with computing and AT products. The aim of these questions was to verify whether the user had been exposed to the benefits of computing and AT products. The initial questions focused on familiarity with computing operating systems and hardware. The following question focused on the awareness of AT products such as screen magnification software and text-to-speech programs.

A large block of questions in this section focused on the knowledge and use of computing and AT. The questions were designed to establish initially if there was a difference between having a conceptual understanding of computing and AT products and actually using the products to achieve tasks. The questions also differentiate between the use of applications and the OS on the computer and the AT used to provide access to the applications or OS.

Another key indicator of the computing experience for respondents was determining their attitude towards purchasing new technologies. Respondents were asked about the willingness of an individual to participate in new technologies. The four choices were based on the interview conducted with the representative from Microsoft who indicated that people with disabilities can essentially be broken up into four categories when it comes to embracing new technologies. Those four categories consist of constantly using the latest computing technology, generally seeking advice or wait for the market response before using new computing technologies, only embrace new computing technologies when it was absolutely necessary and not use new computing technologies at all.

The remaining questions in this section were used to determine if the comfort level in using a computer was affected by the use of AT, the use of accessibility tools in the OS or the changing of colour schemes within the OS. Each of these elements contributed to the assessment of whether or not the use of such tools improve access to computing applications and the Internet through further analysis. Essentially, this section was designed to determine if there were difficulties in the overall computing experience which may have contributed to the disability divide.

Section C initially focused on asking the respondent to identify their familiarity with various Internet products including web browsers, e-mail programs, chat programs, newsgroups and peer-to-peer file sharing programs. The purpose of this section was to determine the exposure of different Internet products to people with vision disabilities.

The next block of questions were similar to those in Section B regarding the differentiation between conceptually understanding the Internet and being able to use the Internet effectively. In addition, these questions can be compared with the ability to understand and use a computer respectively, thus establishing if there were additional Internet-based barriers preventing access to information.

Other questions in this section were designed to extract specific information regarding Internet use. The questions aimed to find out more about the ability of the respondent to locate information and if the much publicised issue of web accessibility was significant in relation to difficulties in retrieving information.

There were also some questions designed to follow up on information in Section B, verifying if AT used on a computer was also effective on the Internet. The section then endeavoured to gain information regarding other Internet-based technologies, such as the effectiveness of e-mail and real-time chat as communication tools. It also endeavoured to find out if respondents were aware of the disability-specific benefits that information and communication tools could provide. Essentially, these questions were designed to determine if there were any Internet-specific issues which may adversely affect the experience of those surveyed.

Section D was designed to focus on the government and corporate disability divide issues raised primarily in chapters 4, 5 and 6. Such questions included the way in which government departments provide online information, the effectiveness of AT and the significance of media-provided online information. The initial question asked if the government had done a good job in making its web sites and associated technologies accessible to people with disabilities. The purpose of this question was to determine the extent to which government sites are, or perceived to be, inaccessible. Another key area of questions focused on media-related issues. The first asks if the Internet was the preferred option over other media in locating

news and media-related information. The second asks if a news site was easy to find but locating specific content on the site was difficult. The purpose of these questions was to determine if people with vision disabilities use the Internet as their primary information source and to find out if the way in which information was provided on a news site can be easily located.

The respondents were asked in this section if the makers of computer Operating Systems have a good understanding of what people with disabilities need in order to access computers and if the design of the computer itself could be improved to help use a computer more effectively. Pricing issues were also raised. The purpose of these questions was to determine if respondents perceived that the corporations were doing a good job in providing access to technology to people with vision disabilities, both in terms of the OS and the hardware. The third question was designed to determine if the additional burden of having to buy AT was preventing people with vision disabilities from accessing computing technologies. A question regarding the need for help when using the Internet was also asked. The purpose of this question was to determine if the use of computers was truly independent for people with vision disabilities. This question was of particular relevance when compared with the personal living arrangements data as it could help confirm if sharing accommodation allows for easier access to computing and Internet-related technologies for blind and vision impaired people. The final question of the main survey, Question 45, asked if learning how to use AT was a simple process which could easily be mastered. This question was designed to determine if AT products were deemed to be intuitive. For more information regarding the survey questions, please refer to Appendix B.

Volunteers who assisted in entering the survey data were given an additional question asking what the original format was for the survey. One option can be selected out of web page, print, Braille or telephone interview. Respondents completing the online version of the survey do not see this question and a response of 'web page' was automatically submitted.

Once the survey was completed, a trial was necessary to ensure the effectiveness of the questions. In February 2004, a trial of the survey had been

conducted with six blind and vision impaired Internet users. The trial participants were students at Curtin University of Technology, studying a course teaching blind and vision impaired people computing skills. The trial group consisted of six in total, three people who were blind and three who were vision impaired. All three blind users relied on the use of JAWS to access the online survey form whilst the vision impaired group consisted of one person who used a screen magnification program and two who were able to use a standard OS environment with minor colour and text size changes. The aim of the trial was to verify that the methods of survey distribution were appropriate in terms of the different formats. The users with vision confirmed that that print was large enough for their vision and the blind users confirmed that the Braille had been accurately converted from the print edition. All six people involved in the trial proceeded to complete the survey via the online form and confirmed that the survey was compatible with all forms of AT used. The trial was conducted in a classroom environment and all surveys were completed at the same time.

Feedback from the trial was generally positive with respondents stating that they felt the questions provided a good overall assessment of computing and Internet-related issues. Several questions were reworded slightly to improve the grammatical nature of the survey but the overall meaning of all questions remained unchanged in the final distribution. The negative comments produced by the trial consisted of a reluctance to divulge all of the requested personal information contained in Section A. There was also an objection to having to make 'definite' decisions on questions, such as Question 28, which asks if a person's disability can prevent them from using the Internet. Many in the trial would have liked to have had a 'sometimes' option instead of making a decision. It was deemed prior to the commencement of survey distribution that although these comments may be valid, personal data were necessary to determine if factors such as levels of eyesight, education and income levels were factors in preventing people from accessing computing and Internet-related technologies. It was also decided that the selection of questions would remain as a positive or negative response due to the need for clearly defined opinions in this study. The trial data also allowed for the testing of an appropriate statistical package to compile the results for this thesis. Based on the

format of the data and the recommendation of Curtin University of Technology, it was decided to use SPSS 12.0 for all statistical and graphing analysis in this thesis.

7.2.3 Survey distribution

Once the survey instrument was established and the trial completed, it was necessary to establish the survey distribution process. Most surveys involve paper copies which can be completed by pen (Trochim, 2002). However, for this research task, paper surveys would not be easily applicable as the surveyed individual may not be able to see the survey, nor have any assistance to help fill out the survey. Therefore the first task was to determine what formats were appropriate when trying to conduct a survey of people who are blind or vision impaired. After several discussions with representatives from the Association for the Blind of Western Australia (ABWA) and the Western Australian Retinitis Pigmentosa Foundation (WARPF), it was determined that there were four formats that could effectively ensure the availability of the survey to people with vision disabilities:

- a large print paper version to be distributed via a conventional mail out.
- a large print edition to be placed online
- a Braille edition which was prepared for mail out
- an option for a telephone interview.

Although the telephone interview would have been too overwhelming for the entire survey process, the limited numbers of people who were likely to use this option made it manageable.

In order for the survey to be filled out and returned, the large print paper copies included a reply-paid envelope, as did the Braille copies. However, the Braille copies required a larger envelope due to the size of the Braille page and the fact that it cannot be folded due to disrupting the effectiveness of the raised dots on the page. The online form was designed to ensure W3C accessibility compliance and included a high contrast colour scheme. It would work with popular AT products such as screen magnification software and text-to-speech devices. It also needed its own domain name to make it easier for participants to remember the site and avoid confusion with other web sites. Completion of the online survey was achieved by the

selection the various options followed by the 'submit' button at the end of the survey. At the completion of the survey, data would be submitted by e-mail.

Due to the researcher's own vision loss, it was determined that volunteers would be needed to help convert the print, Braille and notes from the telephone survey into an electronic form. Although the data could be copied from the print and entered into the online version of the site, such data conversion would remove the ability to identify the original format of the data. It was initially thought that an additional question could be added regarding the type of format used, but it was deemed that such a question would confuse individuals who were filling out the online survey. As such it was determined that a separate site would be set up for volunteers to enter data which contained the additional question about the original format of the survey. All survey data would therefore be e-mailed to the researcher.

Once the format of the instrument had been determined, the next task was to determine the mechanism for distribution and recruitment. In order to gain an understanding of the disability divide in Australia, it was deemed necessary to distribute the survey nationwide. In order to preserve the anonymity of the people receiving the survey, it was necessary to have a third party physically address and send the surveys for the print and Braille formats. The online and telephone interview options required significant advertising to ensure that people were aware of the web site and the telephone number for these options. In order to proceed with the mail outs, it was decided that every organisation dedicated specifically to supporting blind and vision impaired individuals should be contacted. Once the organisations confirmed their membership numbers, the surveys were posted in bulk to the respective organisations who then addressed and posted the surveys using their own membership list. This allowed for the preservation of confidentiality during the distribution process.

Once the distribution process was determined, it was necessary to determine the contents of the survey itself. The survey required questions relating to personal demographics such as age, gender, educational level and income (Cavana & Delahaye, 2001). Due to the nature of this study it also required questions relating to the type and significance of an individual's disability. In order to address the aims of

the study it needed to contain questions relating to computing and Assistive Technology knowledge, Internet knowledge and the impact of government and corporate decisions on their ability to access computing and Internet-related technologies. An additional comments section was also needed to ensure that people had the opportunity to express additional concerns not raised during the questionnaire process.

Due to the personal nature of the questions, ethics approval was sought and gained from the University prior to distributing and advertising the survey. To comply with ethical guidelines, the complete survey instrument consisted of:

- an information sheet
- a consent form and
- a survey.

The Information Sheet included information about the title of the study, aims of the survey, participation interaction, ethics approval, confidentiality and security, risks and where to obtain further information including the contact details of the researcher and the supervisors. The consent form asked the respondent if they understood the purpose of the study, that questions could be asked, that support could be withdrawn, that permission was granted for participation and an assurance of confidentiality. In the print form of the survey, a name, signature and date was required for consent. In the Braille format, the same information would be required either in print or typed in Braille. The telephone interview required the equivalent verbal consent and the online format required the user to fill out the same details on a separate consent form web page before receiving access to the survey. The complete format of the final information sheet, consent form and survey can be found in Appendix B.

The first step taken in actually distributing the survey was to contact the various blind and vision impaired organisations around Australia to find out who was willing to participate. Contact was established with every major state-based blind and vision impaired organisation along with all branches of Retina Australia and Blind Citizens Australia. Over a three month period from September 2003 to December 2003, formal ties were successfully established with nine organisations. These included The ABWA, the Royal Blind Society of New South Wales (RBS),

the Royal Society for the Blind of South Australia (RSB), Retina Australia (Australian Capital Territory), Retina Australia (Victoria), Retina Australia (Queensland), The WARPF and Blind Citizens Australia.

The format of surveys sent were largely determined by the type of organisation. The Retina Australia branches and the WARPF have primarily vision impaired members and as such it was felt that the large print questionnaires would be the best option. Blind Citizens had records which indicated whether or not a member was blind or vision impaired and as such Braille copies were sent to blind members and print copies to vision impaired members. Additional advertising was done via an interview recorded for the Blind Citizens audio cassette newsletter. The ABWA included the large print survey mail out with their print newsletter and recorded information about the web site and telephone interview options on their audio newsletter. The RBS were not prepared to post out the surveys, believing that it was better for clients to go for an 'opt-in' approach instead of receiving the survey via a mail out. However, it was happy to leave a collection of surveys at their reception desk and advertised the fact in their newsletter. The RSB was also unable to mail out the surveys but did put a notice on its web site which alerted visitors to the online and telephone interview options of the survey.

The online format was created during February 2004 and was placed online on 1 March 2004. The telephone interview option was set up through the use of a university telephone number with voice mail. The message asked people to leave their name, number, the state or territory in which they were calling from and a convenient time to be contacted. A volunteer then contacted the individual at their suggested time and conducted the interview. Advertising for the online and telephone interview options was conducted through community radio announcements and interviews in Western Australia and South Australia. Information regarding the survey was distributed on the Retinitis Pigmentosa Mailing List (RPLIST), available at http://www.dixonvision.com/rplist/, and on The Vision Impaired Persons List of Australia (VIP-L), available at http://www.bca.org.au/vip-l.htm, shortly after the 1 March 2004. There was an immediate response after these postings.

The print and Braille formats were distributed by the participating organisations between March 2004 and June 2004 with the exception of the ABWA which were distributed in August. As noted in Figure 7.1 the total number of print and Braille surveys distributed was 4428.

Organisation	Distribution	Print	Braille	Total
ABWA	Mail out	2200	0	2200
RBS (NSW)	Pickup	80	10	90
RSB (SA)	Online	0	0	0
RA (ACT)	Mail out	33	0	33
RA (VIC)	Mail out	300	0	300
RA (QLD)	Mail out	300	0	300
WARPF	Mail out	155	0	155
BCA	Mail out	1110	240	1350
Total		4178	250	4428

Figure 7.1 Print and Braille Survey Distribution

In terms of costs, the University funded the supply, printing and return postage costs of the reply-paid envelopes. The reply-paid envelopes incorporated a bar code which allowed Australia Post to charge the University only for the surveys which were returned. The University also allowed for the Braille surveys to be printed on the Braille embosser and for the boxes of the surveys to be sent to the various organisations for distribution. Personal costs included the printing of the print-based surveys and the envelopes for the surveys to be posted. In addition, personal costs included the postage and time incurred by the various organisations for posting the surveys with the exception of Retina Australia http://www.bca.org.au/vip-l.htm (Queensland) and the WARPF who both waived the postage distribution costs to help support this study.

7.2.4 Response to the survey

A total of 512 surveys were returned, of which 369 were deemed to be valid survey responses. Most of the invalid surveys were either returned as blank or had less than 50% of the questions completed. However, most surveys that were over 50%

completed were generally complete or near-complete. The removal of incomplete surveys was important to ensure that these results did not bias the survey, whilst at the same time it was important not to exclude those who may have missed a few questions, especially given that the reason may have been due to a vision impairment. As such, several questions feature less than 369 responses in the survey data. In many cases notes were supplied with the invalid written responses. These notes explained that many of the invalid responses were due to an unwillingness to participate in the survey or a fear that confidentiality would be breached.

Format of Completed Survey

		Frequency	Percent
Valid	Website	73	19.8
	Print	272	73.7
	Braille	3	.8
	Telephone Interview	21	5.7
	Total	369	100.0

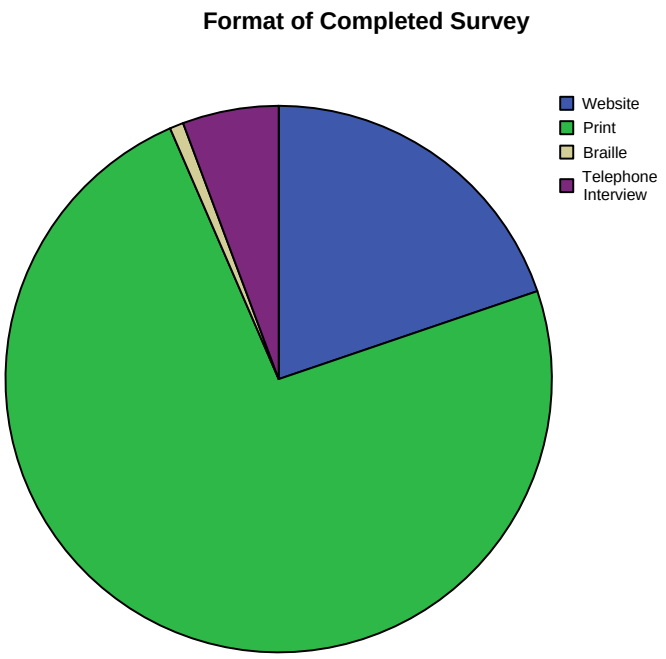


Figure 7.2 Table and pie graph of the format of completed surveys

Of the 369 valid responses, the print responses represented a fraction over 73% of respondents with 272 returned surveys. As noted in Figure 7.2, the online responses represented nearly 20% of respondents. The telephone interview and Braille respondents combined represented a little under 6% of the total responses

with 23 telephone interviews and 3 direct Braille responses. Essentially these two categories should be combined as many of the Braille survey recipients chose to respond via the telephone interview option as it was more convenient than trying to complete the survey in Braille.

7.3 Reliability and validity

The survey approach described above was designed to provide a stable, consistent and reliable mechanism for gathering data. During the creation and distribution process of this study, every effort was taken to ensure that the results of the survey were deemed to be a reliable and valid representation of the experiences and opinions of blind and vision impaired people across a broader population than the sample surveyed. Although it is difficult to gauge the percentage of responses due to the use of several distribution methods, it was the fact that there were so many distribution methods that provided the opportunity for many blind and vision impaired people to present their point of view. It is reasonable to assume that the data collected are a reasonable sample of the blind and vision impaired population. In addition, the reliability and validity of this survey could be verified against ABS data and other statistical sources as discussed earlier in section 3.2. The personal information contained within the survey of age, gender, rate of employment and responses between blind and vision impaired were within a similar percentage rate to other statistical information due to the large sample size. This assisted in ensuring that the fundamental elements of the survey are valid and reliable.

There were, however, several difficulties during the survey distribution process that need to be taken into account when considering the validity of this survey. Firstly, there were difficulties in reaching every blind and vision impaired person due to the varying levels of cooperation within the blind and vision impaired organisations throughout Australia. This uneven distribution of surveys and the lack of opportunity for all to participate was considered when examining the validity of these data. Another important consideration was the issue of self-selection. It was possible that people who had higher levels of IT expertise were more inclined to answer an online survey given that it was available in the IT environment. However, this did not detract from the validity or reliability of the study given the high number

of print responses and the fact that this study was endeavouring to identify issues surrounding IT access that would affect blind and vision impaired users at all level of expertise. In addition, it was difficult to gauge the effectiveness of the multiple survey distribution formats. It might be possible that people who required one type of format may have received an incorrect alternate format. Again, this would have affected the opportunity for participation in the study. Furthermore, several organisations did not include cover sheets on the survey distribution which resulted in some respondents being unsure as to how their personal details were obtained and as a result specifically chose not to participate in the study.

However, despite some of the potential reliability issues with the distribution, it is difficult at this stage to perceive a better way of undertaking the survey with the limited resources available. Essentially, despite these difficulties, the number of responses was quite significant when exploring a subset of a minority group. The result of 369 valid responses has provided a good representative of the total blind and vision impaired population in Australia. However, to put the results in their correct context, the data are more significant in mapping trends rather than specific percentile information.

7.4 Survey data

7.4.1 Personal information

Section A of the survey examined the personal information of the respondents. In order to assist blind and vision impaired readers of this thesis, all data will be presented in tabular, graphic and textual form.

Age

		Frequency	Percent
Valid	18-24	33	8.9
	25-34	48	13.0
	35-44	60	16.3
	45-54	87	23.6
	55-64	76	20.6
	65+	65	17.6
	Total	369	100.0

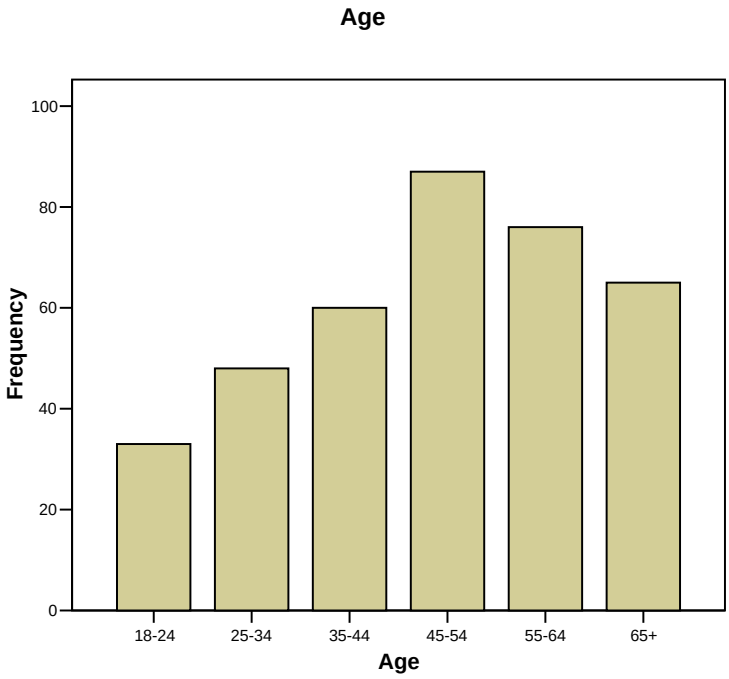


Figure 7.3 Table and bar graph of the age categories of respondents

The first question of the survey, concerning age, was separated into the same categories as the Australian Bureau of Statistics for consistency. All valid responses contained data about the age of the respondent. As noted in Figure 7.3, there were 33 responses from the 18-24 age group, 48 from the 25-34 age group, 60 from the 35-44 age group, 87 from the 45-54 age group, 76 from the 55-65 age group and 65 from the 65 and over age group. The greatest concentration of respondents was the 45-54 age group which represented nearly one quarter of the response rate.

Location

		Frequency	Percent
Valid	New South Wales	69	18.7
	Victoria	101	27.4
	Queensland	60	16.3
	South Australia	21	5.7
	Western Australia	103	27.9
	Tasmania	6	1.6
	Northern Territory	2	.5
	Australian Capital Territory	7	1.9
	Total	369	100.0

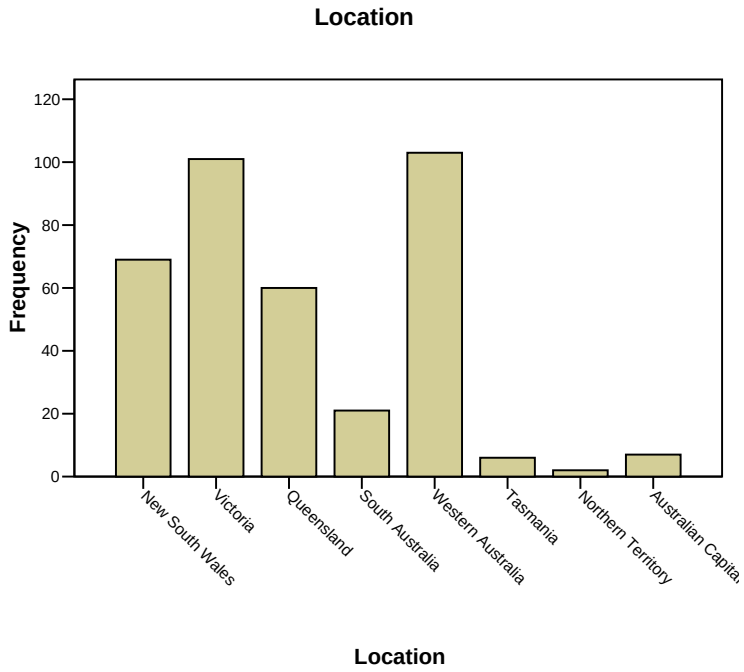


Figure 7.4 Table and bar graph of the location categories of respondents

In Question 2, the location of respondents can be presented by states and territories. The respondent was prompted for their postcode from which the categories have been determined. As seen in Figure 7.4, there were 69 respondents from New South Wales, 101 from Victoria, 60 from Queensland, 21 from South Australia, 6 from Tasmania, 2 from the Northern territory and 7 from the Australian Capital Territory. Western Australian had 103 respondents or a fraction under 28% of the total survey population.

Gender

		Frequency	Percent
Valid	Male	177	48.0
	Female	192	52.0
	Total	369	100.0

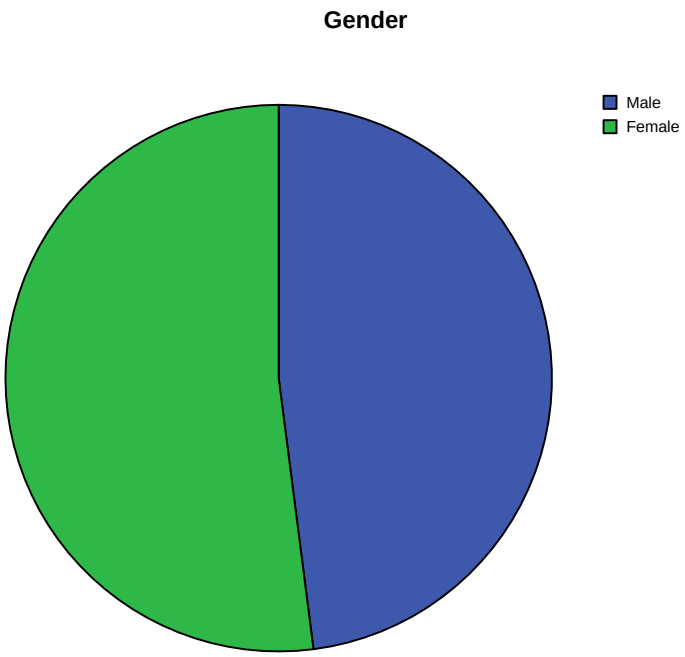


Figure 7.5 Table and pie graph of the gender of respondents

Question 3 asked respondents about their gender. As noted in Figure 7.5, there were 177 or 48% male respondents and 192 or 52% female respondents. This represented a fairly even balance between the sexes in terms of survey response.

Living Arrangements

		Frequency	Percent
Valid	With Parent(s)	45	12.2
	Shared Accomodation	25	6.8
	With Partner	205	55.6
	Alone	93	25.2
	Total	368	99.7
Missing	System	1	.3
Total		369	100.0

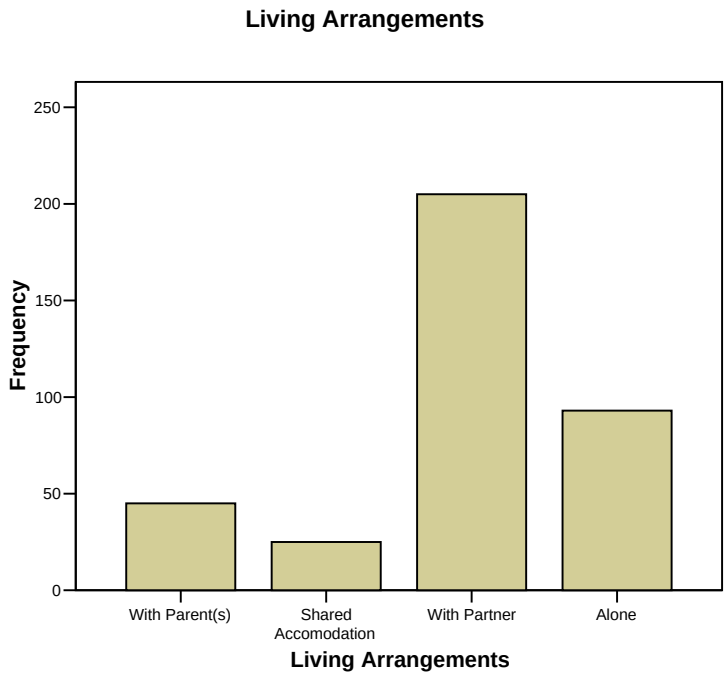


Figure 7.6 Table and bar graph of living arrangements for respondents

In question 4, respondents provided information about their living arrangements. As noted in Figure 7.6, the largest number of respondents was those living with a partner which consisted of 205, or over 55% of the respondents. The next largest was those living alone which is 93, or a little over 25% of the respondents. 45 respondents lived with a parent or parents whilst 25 lived in shared accommodation. One person surveyed did not answer this question.

Employment Status

		Frequency	Percent
Valid	Full-Time	80	21.7
	Part-Time	54	14.6
	Casual	38	10.3
	Unemployed/Retired	197	53.4
	Total	369	100.0

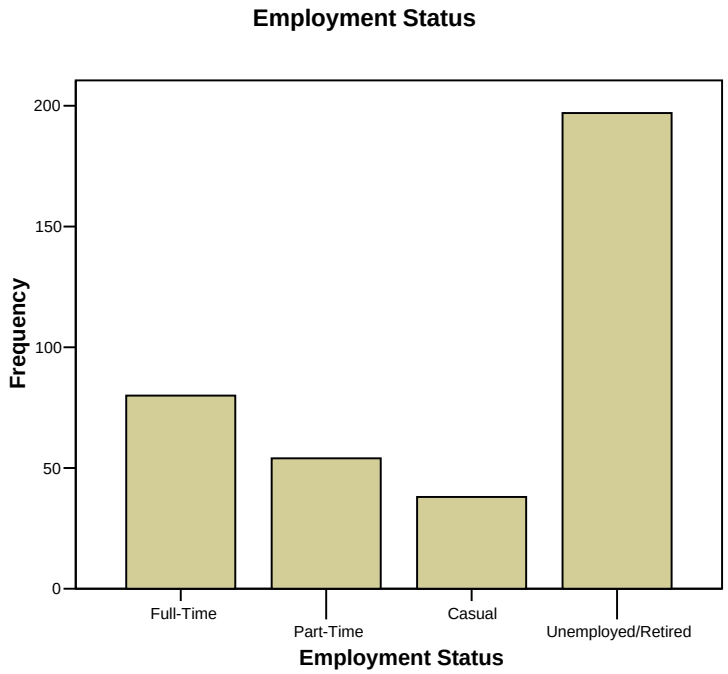


Figure 7.7 Table and bar graph of employment status for respondents

In question 5, respondents were asked about their employment status. The results show that 197 or over 53% of the respondents were either unemployed or retired. As noted in Figure 7.7, 80 respondents were working full-time, 54 were working part-time and 38 were casually employed.

Income

		Frequency	Percent
Valid	<$15000	144	39.0
	$15,001-$25,000	69	18.7
	$25,001-435,000	52	14.1
	$35,001-$45,000	29	7.9
	$45,001-$60,000	34	9.2
	$60,000+	34	9.2
	Total	362	98.1
Missing	System	7	1.9
Total		369	100.0

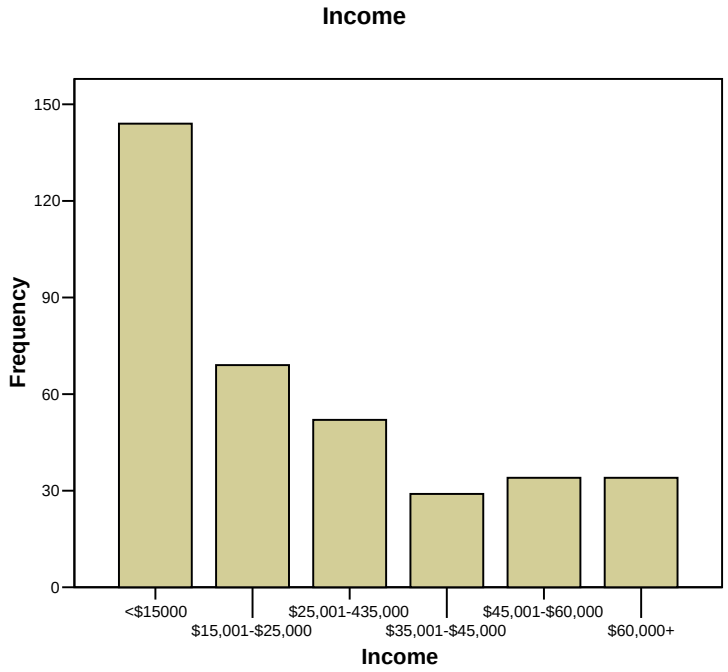


Figure 7.8 Table and bar graph of income levels for respondents

In question 6, respondents were asked about their level of income. As noted in Figure 7.8, 144 or 39% were earning $15,000 or less, 69 respondents were earning between $15,001-$25,000, 52 were earning $35,001-$45,000, 29 were earning $35,001-$45,000 and there were 34 for each of the remaining two categories. There were 7 valid surveys returned that did not answer this question.

Vision Stability

		Frequency	Percent
Valid	Degenerative	215	58.3
	Stable	154	41.7
	Total	369	100.0

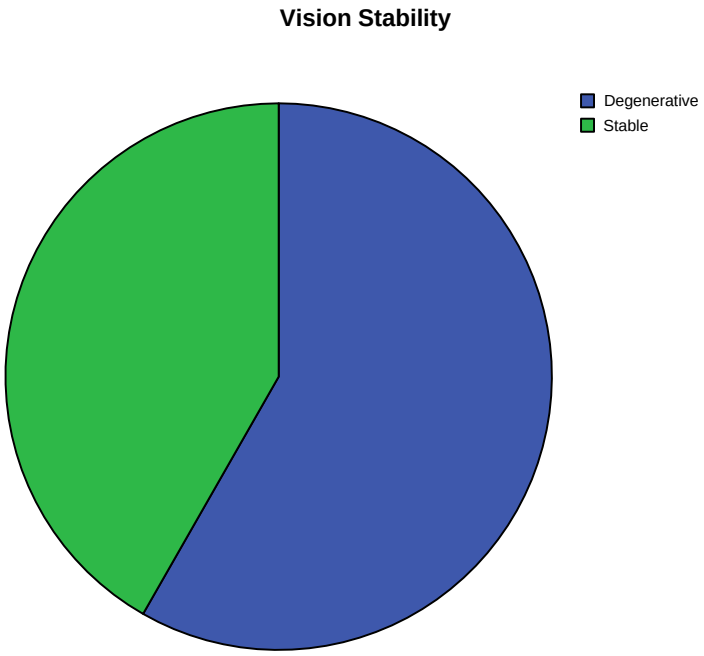


Figure 7.9 Table and pie graph of vision status for respondents

Question 7 asked about disability-specific information regarding vision stability. The survey results indicated that a majority of respondents have degenerative eye conditions. As indicated in the pie graph of Figure 7.9, there were slightly more than 58% of the respondents with a degenerative condition as opposed to slightly less than 42% with a stable condition.

Description of Vision

		Frequency	Percent
Valid	No Vision	53	14.4
	Vision Impairment	315	85.4
	Total	368	99.7
Missing	System	1	.3
Total		369	100.0

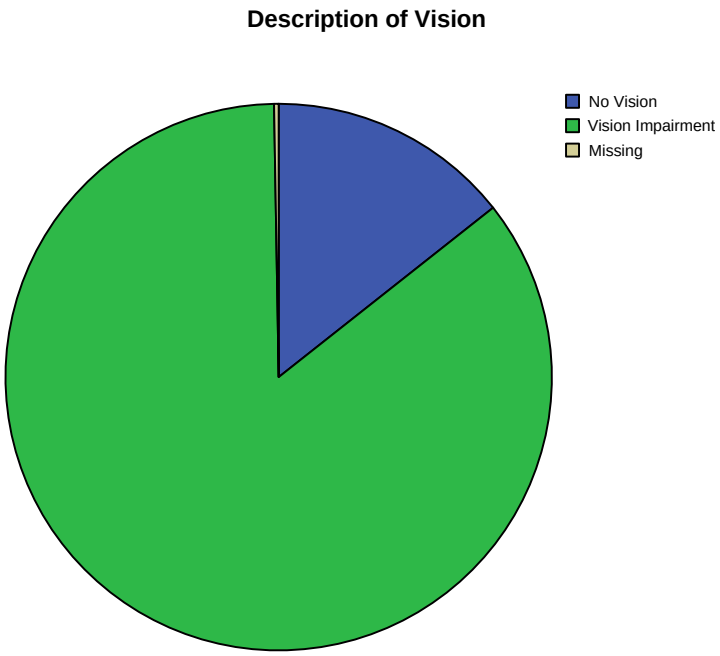


Figure 7.10 Table and bar graph of vision description for respondents

The next disability-specific question determined the types of vision impairments faced by the survey respondents. The categories of different vision impairment types were included so that eye conditions unrelated to this study, such as night vision impairment, could be excluded. However, there were no cases of unrelated eye conditions contained in the survey results. As such the data have been separated into two categories: those with no vision and people who are vision impaired. As shown in Figure 7.10, there are 53 or a little over 14% of respondents who have no vision and 315 or a little over 85% who are vision impaired. One respondent did not answer this question.

Education - Highest Completed

		Frequency	Percent
Valid	Year 10	95	25.7
	Year 12	62	16.8
	TAFE Diploma	58	15.7
	University Undergrad	72	19.5
	University Postgrad	52	14.1
	Total	339	91.9
Missing	System	30	8.1
Total		369	100.0

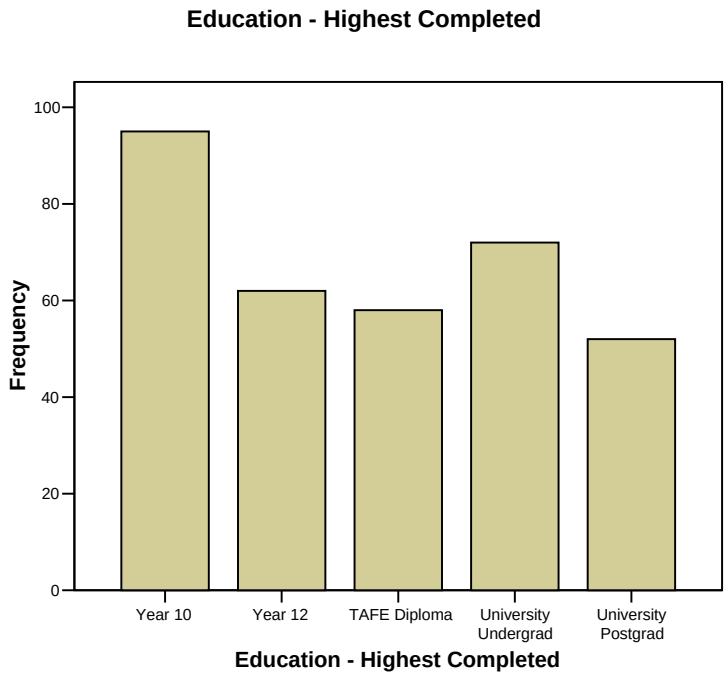


Figure 7.11 Table and bar graph of highest educational level for respondents

Questions 9 and 10 examined the educational level of the respondents. The first of these, question 9, asked the respondents to select all completed levels of education. According to the results shown in Figure 7.11, 30 respondents or 8%, did not respond to this question. This is most likely due to either a decision not to reveal educational levels or because the respondents left the educational system before Year 10. Over one quarter of the respondents only completed their schooling to Year 10 whilst nearly 17% completed their schooling to Year 12. 72, or 19.5% went onto complete a TAFE qualification whilst 72, or a little over 14% completed a university undergraduate qualification. 52 completed a university postgraduate qualification.

Education - Current

		Frequency	Percent
Valid	Secondary	5	1.4
	TAFE Diploma	17	4.6
	University Undergrad	15	4.1
	University Postgrad	11	3.0
	Other	31	8.4
	Not Studying	282	76.4
	Total	361	97.8
Missing	System	8	2.2
Total		369	100.0

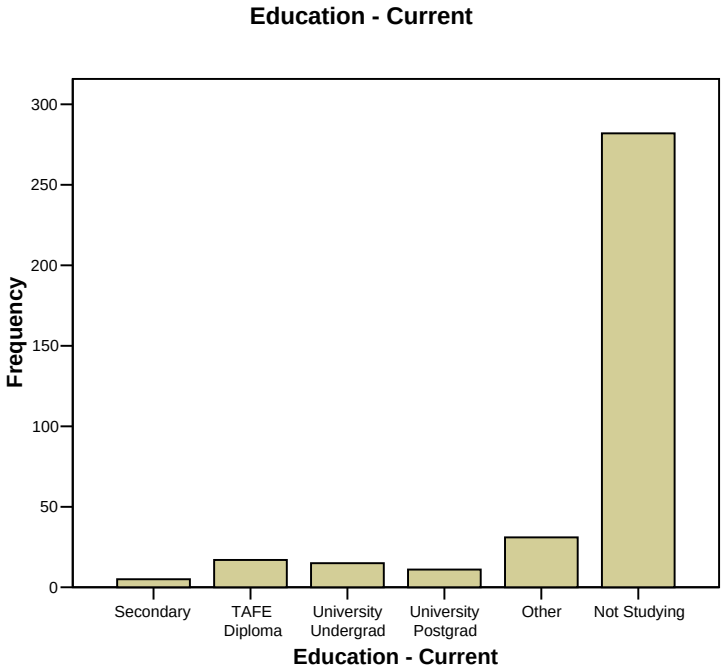


Figure 7.12 Table and bar graph of current educational study for respondents

The second of the educational questions asked about the level of education that is currently being pursued. As shown in Figure 7.12, 282, or over three quarters of the respondents, were not undertaking any study at this time. Only 5 respondents were currently completing secondary education whilst there were 17 completing a TAFE course, 15 completing a university undergraduate course and 11 completing a university postgraduate course. 8% of respondents were completing other courses such as workplace training courses and IT courses. Eight respondents chose not to participate in this question.

7.4.2 Computing and assistive technology knowledge

Section B of the survey explored the computing and AT knowledge of the respondents.

Familiarity of Computer Products

		Windows	MacOS	UNIX	Hardware
N	Valid	307	40	30	294
	Missing	62	329	339	75

Figure 7.13 Table of familiarity of computing products for respondents

Question 11 was designed to determine respondents' familiarity with computing products. As indicated by Figure 7.13, the familiarity of products was in line with the market trends for computer products. There were 307 or a little over 83% who were familiar with Microsoft Windows, 40 or a little under 11% of respondents who were familiar with Mac OS, 30 or a little over 8% who were familiar with UNIX OS and 294 or nearly 80% of the respondents who had an understanding of basic computer hardware.

Familiarity with Assistive Technology Products

		Screen magnification	Text to speech	Portable devices
N	Valid	183	139	48
	Missing	186	230	321

		Frequency
	Valid	232
	System	137
Total		369

Figure 7.14 Tables of familiarity with Assistive Technology products for respondents, individual responses (top) and overall cumulative responses (bottom)

Question 12 asked the respondents about their familiarity with Assistive Technology products. The respondents were asked to select all familiar products from the list. As noted in Figure 7.14 (top), there were 183 or nearly half of the respondents who were familiar with screen magnification, 139 or nearly 38% who were aware of text-to-speech software and 48 or 13% who were familiar with portable AT devices. Figure 7.15 (bottom) shows that 232 or nearly 63% of respondents overall had some familiarity with AT.

Knowledge of Personal Computing

		Frequency	Percent
Valid	None	36	9.8
	Poor	41	11.1
	Fair	117	31.7
	Good	140	37.9
	Expert	32	8.7
	Total	366	99.2
Missing	System	3	.8
Total		369	100.0

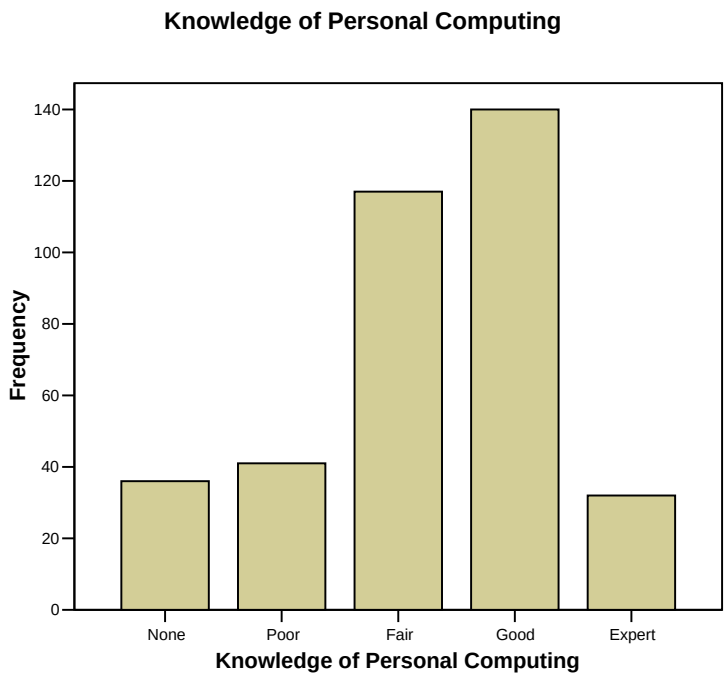


Figure 7.15 Table and bar graph of computing knowledge for respondents

In question 13, the respondents were asked about their overall computing knowledge. The results from this question as shown in Figure 7.15 were interesting in that 140, or nearly 38% of respondents believed that they had a good understanding of personal computing concepts. Only 32 classified themselves as expert and 117 or a little under 32% classified themselves as having a fair understanding of computers.

Knowledge of Assistive Technology

		Frequency	Percent
Valid	None	62	16.8
	Poor	105	28.5
	Fair	104	28.2
	Good	88	23.8
	Expert	10	2.7
	Total	369	100.0

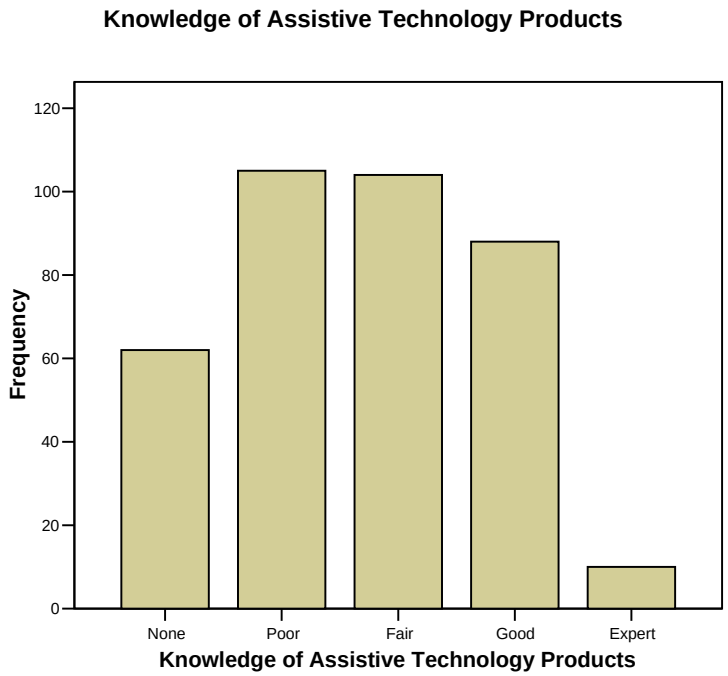


Figure 7.16 Table and bar graph of assistive technology knowledge for respondents

Question 14 asked the respondents about their knowledge of assistive technology. As shown in Figure 7.16 there were 88, or a fraction under 24% who believed they had a good understanding of AT concepts and products. Only 10 respondents classified themselves as experts and 104 believed they had a fair understanding. Over 45% of respondents believed they had either poor or no knowledge of AT products.

Ability to Use a Personal Computer

		Frequency	Percent
Valid	None	45	12.2
	Poor	31	8.4
	Fair	96	26.0
	Good	157	42.5
	Expert	40	10.8
	Total	369	100.0

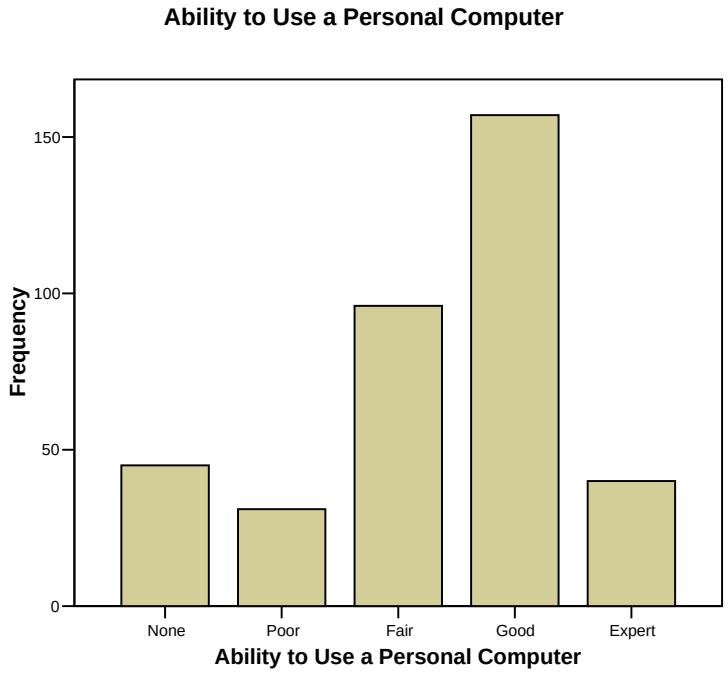


Figure 7.17 Table and bar graph of computing use for respondents

The following two question were similar to the previous two questions except instead of asking about overall knowledge, the questions asked about the specific ability to use computing and AT products respectively. As indicated in Figure 7.17, question 15 indicated that 157 or 42.5% of respondents believed they had a fair understanding of how to use a computer. Expert users were higher with 40 respondents. There were 96 respondents who believed their computer Usage was fair.

Ability to Use Assistive Technology

		Frequency	Percent
Valid	None	95	25.7
	Poor	96	26.0
	Fair	82	22.2
	Good	86	23.3
	Expert	10	2.7
	Total	369	100.0

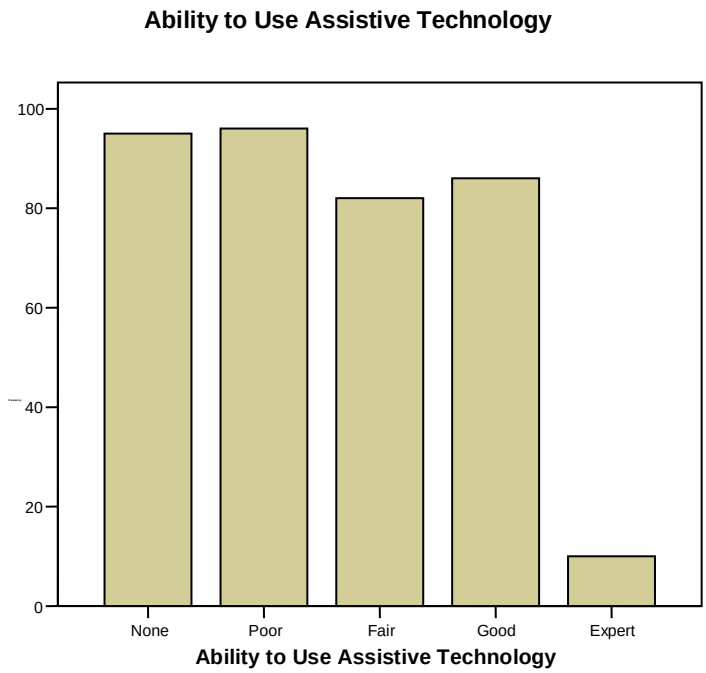


Figure 7.18 Table and bar graph of assistive technology use for respondents

The result of question 16, as indicated in Figure 7.18, shows that the number of respondents who were good and expert users of AT were 86 and 10 respectively, The number of fair users was 82 respondents and the number of poor is 96 respondents, meaning that nearly 52% of respondents had either poor or no knowledge of how to use AT products.

Attitude Towards Computing Technologies

		Frequency	Percent
Valid	Do Not Use	63	17.1
	Only when Necessary	128	34.7
	Wait for Advice	105	28.5
	Latest Technology	73	19.8
	Total	369	100.0

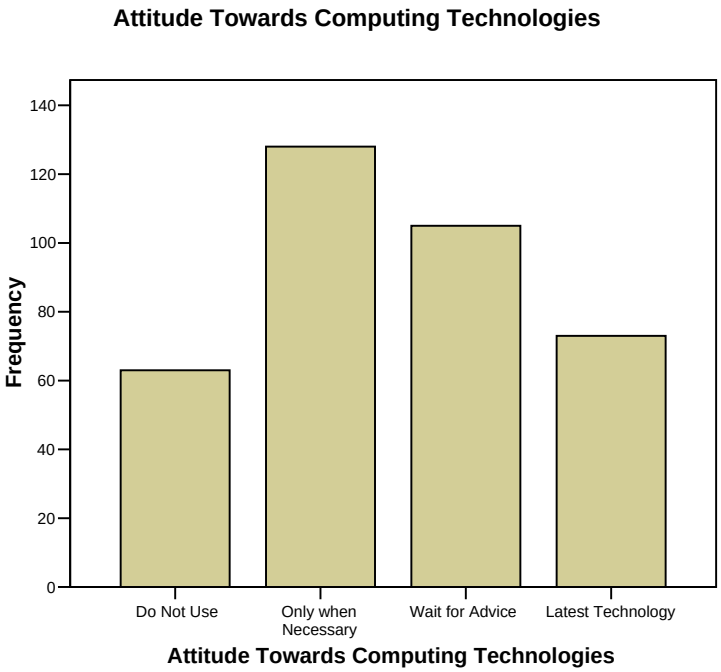


Figure 7.19 Table and bar graph of attitude towards technology for respondents

Question 17 examined the attitude towards embracing computing technologies. The response as noted in Figure 7.19 demonstrated that 128 or nearly 35% of respondents choose to upgrade to new technologies only when it is absolutely necessary. 105 choose to wait for advice before embracing new technologies and only 73 or nearly 20% actually purchased the latest technology. 63 did not generally embrace computing technologies.

Comfortable Using a Computer

		Frequency	Percent
Valid	NA	37	10.0
	Strongly Disagree	21	5.7
	Disagree	30	8.1
	Agree	146	39.6
	Strongly Agree	135	36.6
	Total	369	100.0

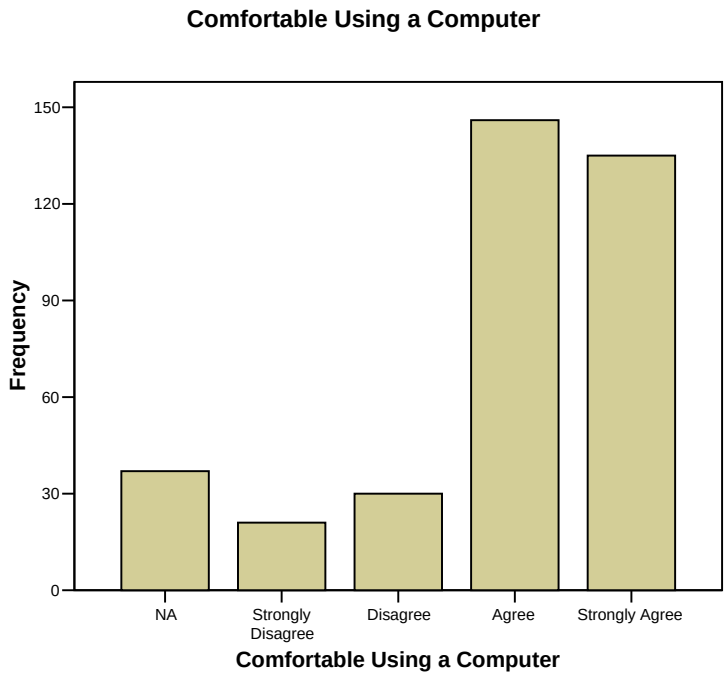


Figure 7.20 Table and bar graph of comfortable computer use for respondents

Question 18 explored how comfortable the overall experience was when using a computer. The results from this question, as noted in figure 7.20, show that 281 or over 76% of respondents either agreed or strongly agreed that using a computer is a comfortable experience. 51 respondents either disagreed or strongly disagreed and 37 respondents perceived the question to be not applicable to their situation.

Require Assistve Technology to use a Computer

		Frequency	Percent
Valid	NA	70	19.0
	Strongly Disagree	32	8.7
	Disagree	45	12.2
	Agree	109	29.5
	Strongly Agree	113	30.6
	Total	369	100.0

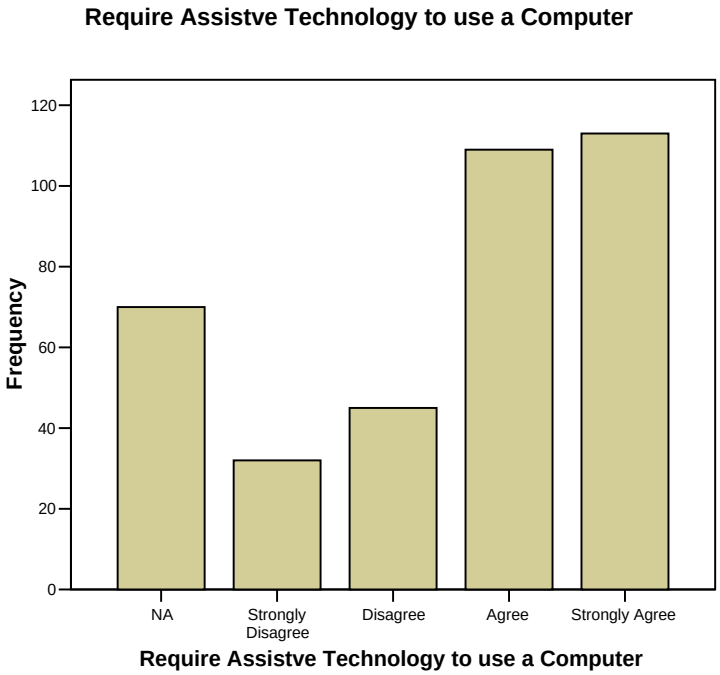


Figure 7.21 Table and bar graph of assistive technology requirement for respondents

Question 19 assessed the need for AT to use a computer. This question, as noted in Figure 7.21, shows that 222, or slightly over 60% of the sample agreed or strongly agreed to the need for AT. Nearly 21% disagreed or strongly disagreed and 19% felt the question was not applicable.

Require Change of Colour Scheme

		Frequency	Percent
Valid	NA	134	36.3
	Strongly Disagree	25	6.8
	Disagree	33	8.9
	Agree	84	22.8
	Strongly Agree	93	25.2
	Total	369	100.0

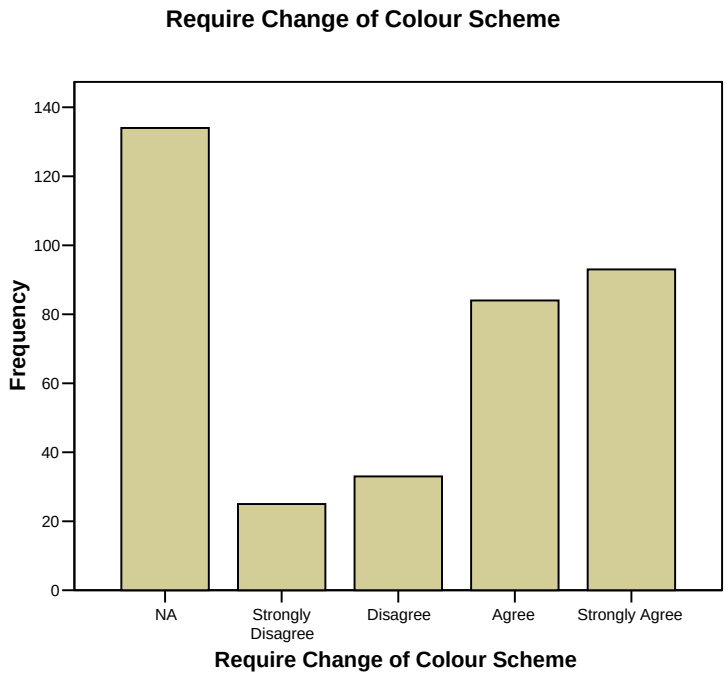


Figure 7.22 Table and bar graph of colour scheme change requirement for respondents

Question 20 asked respondents if the changing of colour schemes on the computer display helped in using a computer. This question applied primarily to those with vision impairment. The highest response was the 'not applicable' option which consisted of 134, or a little over 36% of the respondents. As noted in Figure 7.22, 84 respondents agreed and 93 strongly agreed that changing the colour scheme helped in using a personal computer. This provided a combined total of 177 or 48% of respondents. There were 58 respondents who disagreed or strongly disagreed with the need for this feature.

Built-in OS Accessibility helps to use a Computer

		Frequency	Percent
Valid	NA	91	24.7
	Strongly Disagree	22	6.0
	Disagree	57	15.4
	Agree	141	38.2
	Strongly Agree	58	15.7
	Total	369	100.0

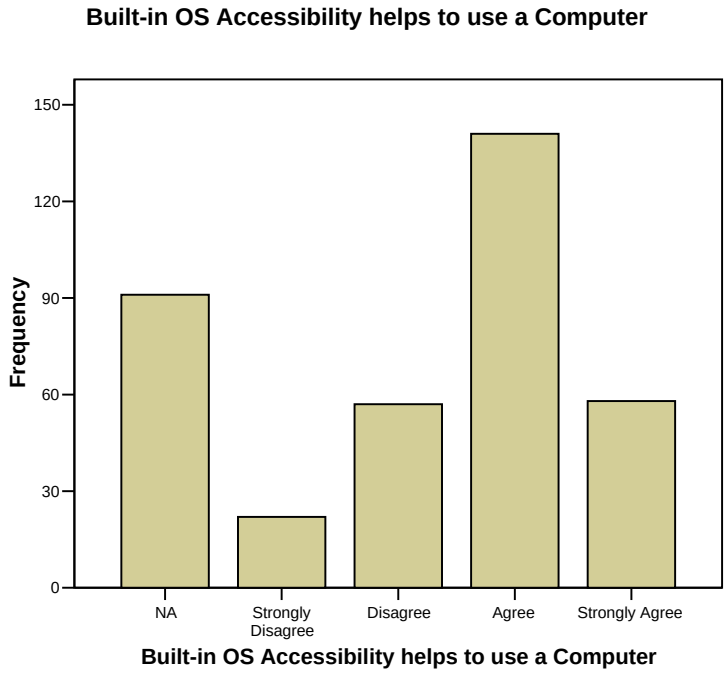


Figure 7.23 Table and bar graph of accessibility features built into the Operating System requirement for respondents

Question 21 was designed to verify the overall functionality of built-in accessibility tools provided in the OS. As outlined in Figure 7.23, there were 91, or nearly 25% who believed that the accessibility tools in the OS were not applicable. There were 141, or a little over 38% who agreed that the tools were useful and 58, or nearly 16% who strongly agreed.

7.4.3 Internet Knowledge

Section C of the survey explored the Internet knowledge of the respondents and their interaction with Internet tools and resources.

Familiarity of Internet Products

		Web browser	E-mail	Newsgroups /mailing lists	Chat	File swapping
N	Valid	259	306	129	121	75
	Missing	110	63	240	248	294

		Frequency
	Valid	313
	System	56
Total		369

Figure 7.24 Tables of familiarity with Internet products, individual categories (top) and cumulative total of product familiarity (bottom)

The first question for this section, question 22, asked the respondent about familiarity with Internet products. The respondents were required to select all that applied out of the list of Internet products. As indicated in Figure 7.24, there were 306, or nearly 83% of users who were familiar with the concept of e-mail and 259, or a little over 70% of respondents who are familiar with web browsing concepts. There were 129 respondents who were familiar with newsgroups and mailing lists; 121 were familiar with chat software and 75 were familiar with file swapping software. Overall there were 313, or nearly 85% of respondents, who had some familiarity with an Internet product.

Understanding of Internet Concepts

		Frequency	Percent
Valid	None	48	13.0
	Poor	56	15.2
	Fair	101	27.4
	Good	130	35.2
	Expert	32	8.7
	Total	367	99.5
Missing	System	2	.5
Total		369	100.0

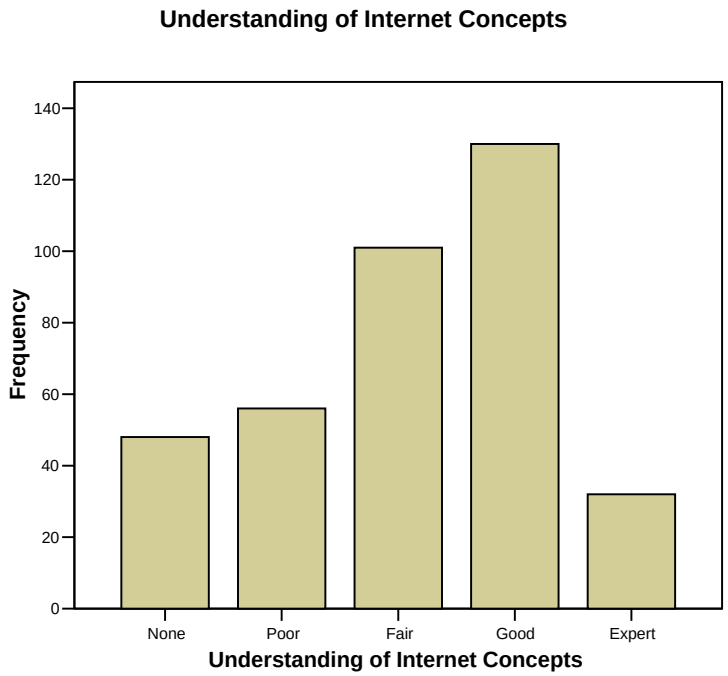


Figure 7.25 Table and bar graph of Internet knowledge for respondents

Question 23 asked respondents about their overall Internet conceptual knowledge of the Internet. The results from this question as shown in Figure 7.25 were interesting in that 130, or a little over 35% of respondents believed that they had a good understanding of Internet concepts. Only 32 classified themselves as expert and 101 or a little over 27% classified themselves as having a fair understanding of the Internet.

Ability to Use the Internet

		Frequency	Percent
Valid	None	67	18.2
	Poor	52	14.1
	Fair	91	24.7
	Good	122	33.1
	Expert	37	10.0
	Total	369	100.0

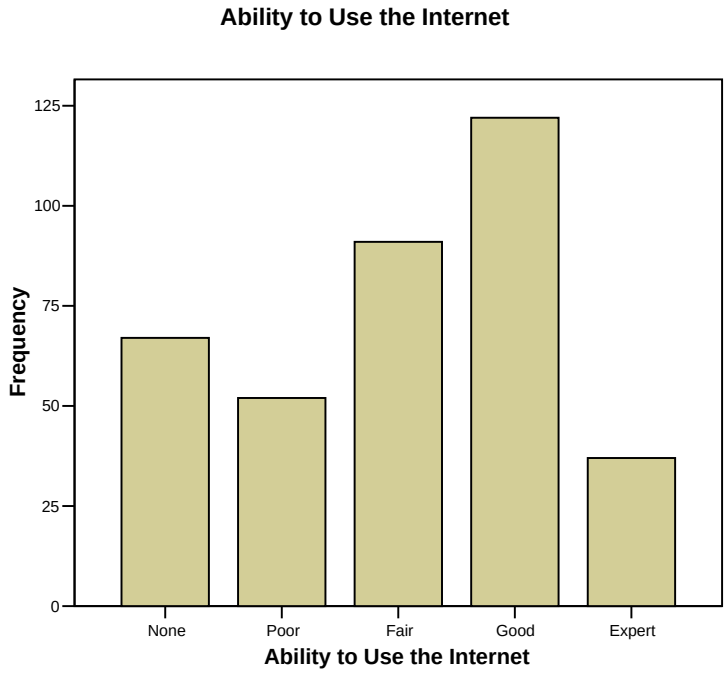


Figure 7.26 Table and bar graph of Internet use for respondents

Question 24 asked respondents specifically about their ability to use the Internet. As indicated in Figure 7.26, there were 67 respondents who had no ability to use the Internet. In addition, there were 122, or one-third of respondents, who believed they had a good understanding of how to use the Internet and 91 had a fair understanding of how to use the Internet. Expert users consisted of 37 respondents. Again there was a general trend of Internet usability with two-thirds of respondents having a fair or better ability to use the Internet as opposed to one-third who had little or no ability to use the Internet.

Easy to Find Information on the Internet

		Frequency	Percent
Valid	NA	70	19.0
	Strongly Disagree	36	9.8
	Disagree	82	22.2
	Agree	144	39.0
	Strongly Agree	37	10.0
	Total	369	100.0

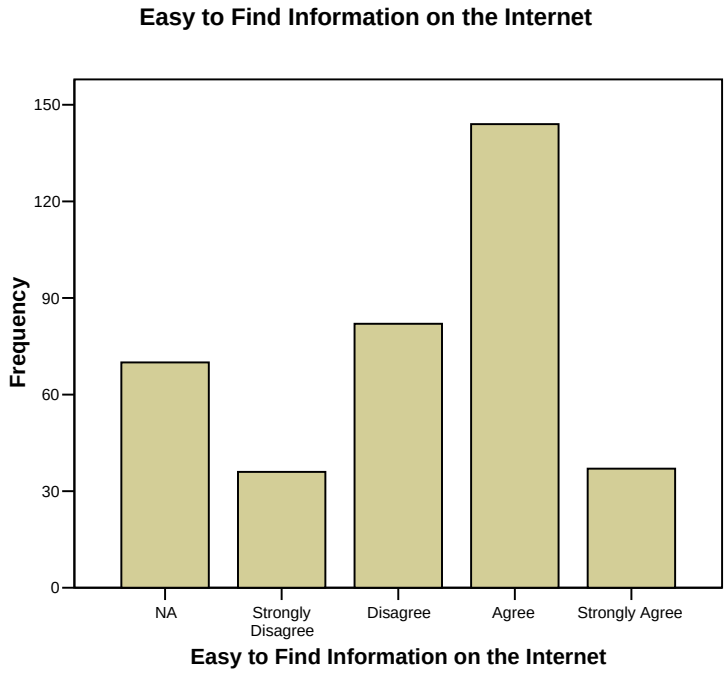


Figure 7.27 Table and bar graph of ease in locating Internet information for respondents

Question 25 asked the respondent if it was easy to find required information on the Internet. As indicated in Figure 7.27, 144 respondents or 39% agreed that it was easy to find information on the Internet. A further 37 or 10% strongly agreed with this statement, meaning that nearly half of the respondents found it easy to locate information. 92 respondents disagreed and 36 strongly disagreed, meaning that 32% of the respondents had difficulties finding information. 70 respondents perceived this question to be not applicable to their situation.

Web Design makes the Internet Difficult

		Frequency	Percent
Valid	NA	87	23.6
	Strongly Disagree	25	6.8
	Disagree	99	26.8
	Agree	107	29.0
	Strongly Agree	51	13.8
	Total	369	100.0

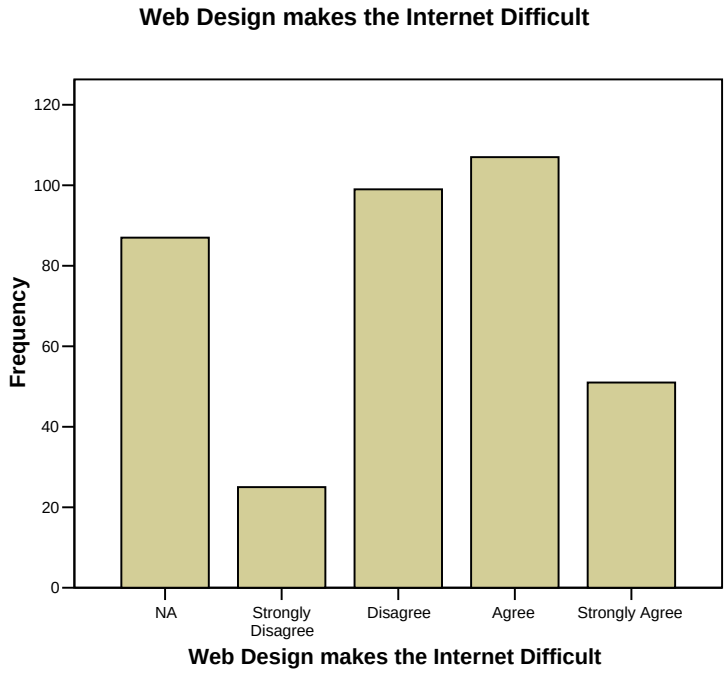


Figure 7.28 Table and bar graph of web design preventing the location Internet information for respondents

Question 26 asked respondents if the way in which web sites are designed prevented the respondent from easily accessing required information. There were 107 respondents or 29% who agreed that the web design was a factor in preventing access to the Internet. There were also 99 respondents or nearly 27% who did not believe that web design was a problem when accessing the Internet. The more extreme views were greatly reduced in this answer with only 51 respondents who strongly agreed that it was difficult and 25 respondents who strongly disagreed with the statement. There were a high number of 'not applicable' responses with 98 or nearly 24% of respondents selecting this response.

Built-in OS Accessibility helps to use the Internet

		Frequency	Percent
Valid	NA	124	33.6
	Strongly Disagree	32	8.7
	Disagree	82	22.2
	Agree	96	26.0
	Strongly Agree	35	9.5
	Total	369	100.0

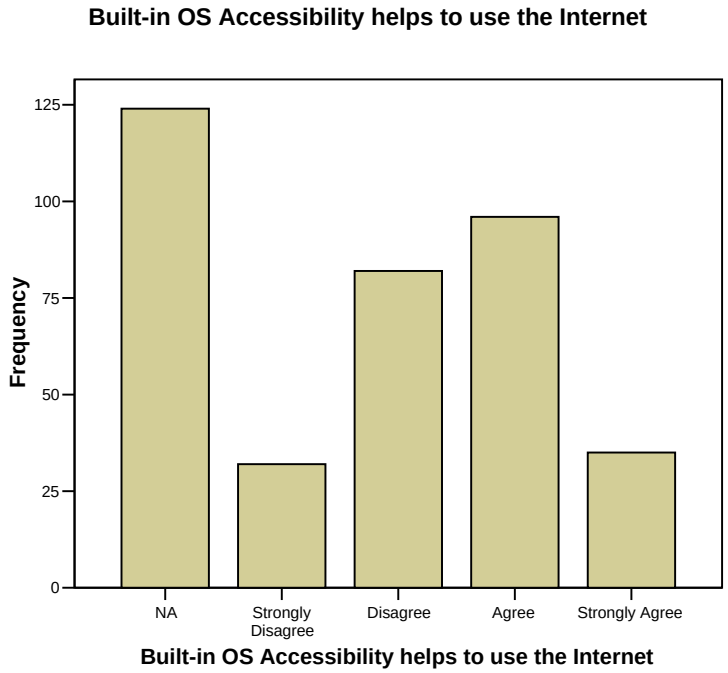


Figure 7.29 Table and bar graph of built-in accessibility helping Internet use for respondents

Question 27 asked if the built-in OS accessibility features helped to use the Internet. As indicated in Figure 7.29, there was again a trend away from the more extreme answers. 96 or 26% of respondents agreed that the built-in OS accessibility features helped when using the Internet and 82 or a little over 22% of respondents disagreed with this statement. Only 35 respondents strongly agreed with the statement and only 32 strongly disagreed with this statement.

Disability Prevents the Use of the Internet

		Frequency	Percent
Valid	NA	68	18.4
	Strongly Disagree	60	16.3
	Disagree	82	22.2
	Agree	99	26.8
	Strongly Agree	60	16.3
	Total	369	100.0

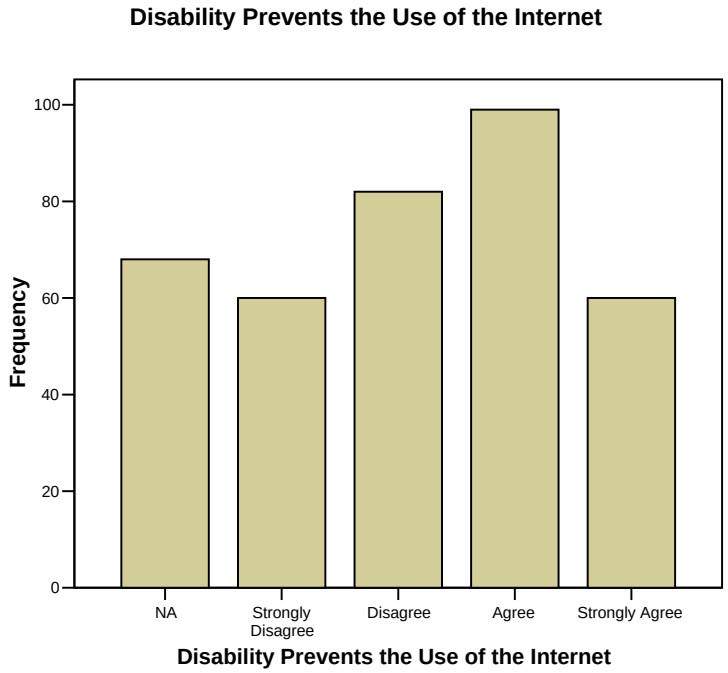


Figure 7.30 Table and bar graph of disability preventing Internet use for respondents

Question 28 explores whether or not a vision disability prevented the use of the Internet. As noted in Figure 7.30, 99 respondents or nearly 27% of the population agreed that disability prevented the use of the Internet whilst 82 or over 22% disagreed with this statement. Both of the strongly agree and strongly disagree selections had 60 respondents apiece and ‘not applicable’ had 68 respondents.

Assistive Technology has Difficulty with Web Pages

		Frequency	Percent
Valid	NA	214	58.0
	Strongly Disagree	15	4.1
	Disagree	55	14.9
	Agree	58	15.7
	Strongly Agree	27	7.3
	Total	369	100.0

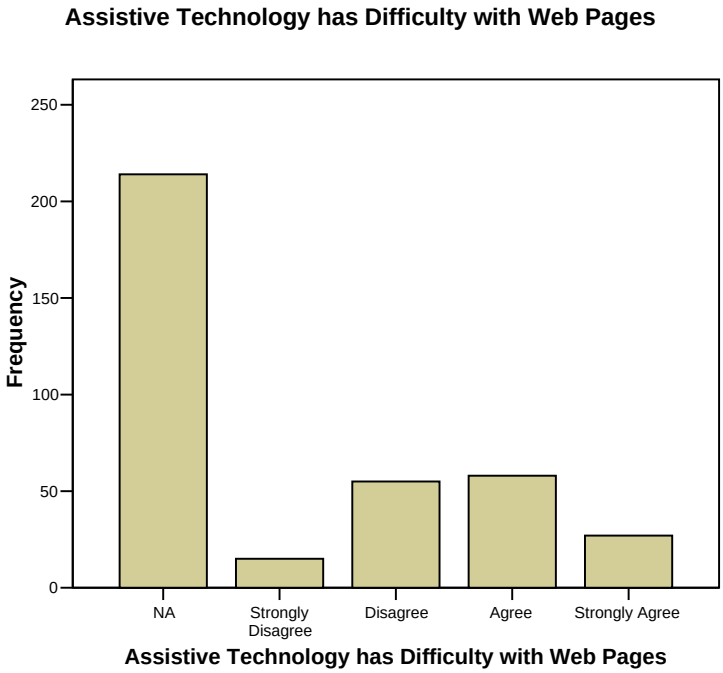


Figure 7.31 Table and bar graph of Assistive Technology having difficulties with web pages for respondents

Question 29 determined if AT software had difficulty in understanding information from web pages. As noted in Figure 7.31, a massive 214 or 58% of respondents indicated that the question was not applicable. This is likely to be due to the fact that the accessibility built into the OS and most third-party AT products simply do not provide the ability to assist with web pages.

In regards to the other options there were 58 or nearly 16% of respondents who agreed that their AT technology had difficulty with web pages and 55 respondents who disagreed with this statement. There were 27 respondents who strongly agreed with the statement and 15 who strongly disagreed with the statement. This again verifies that for those who endeavour to use AT to access web pages, each

Internet session will contain a variety of web pages, some of which will be accessible and some of which will not work effectively with the AT equipment.

E-mail is a Simple Form of Communication

		Frequency	Percent
Valid	NA	52	14.1
	Strongly Disagree	10	2.7
	Disagree	20	5.4
	Agree	111	30.1
	Strongly Agree	176	47.7
	Total	369	100.0

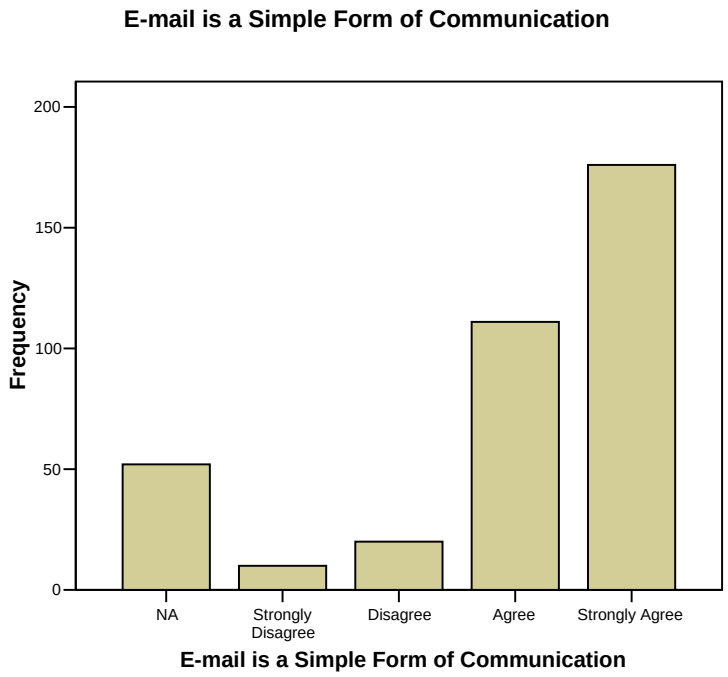


Figure 7.32 Table and bar graph of e-mail being a simple form of communication for respondents

Question 30 asked the respondents if they perceived the use of e-mail as a simple form of communication. The results of this question, as noted in Figure 7.32, show that 176 or nearly 48% strongly agreed that e-mail is a simple form of communication and 111 or a little over 30% agreed with this statement. This means that nearly 78% of respondents had an understanding of an important Internet communication tool such as e-mail and acknowledged that there were merits to the use of this form of communicating. Only 30 respondents either disagreed or strongly disagreed with this statement and 52 perceived the question not to be applicable.

Speech Softare can't Always Understand E-mails

		Frequency	Percent
Valid	NA	250	67.8
	Strongly Disagree	32	8.7
	Disagree	43	11.7
	Agree	27	7.3
	Strongly Agree	17	4.6
	Total	369	100.0

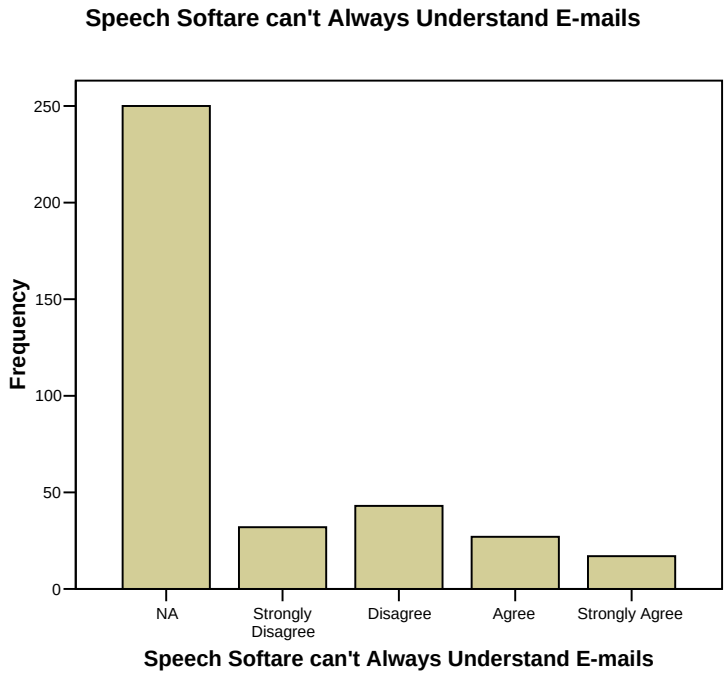


Figure 7.33 Table and bar graph of speech software having difficulties understanding e-mail for respondents

Question 31 asked if the respondent received e-mails that the speech software cannot process. Due to the fact that this question was directed specifically at blind Internet users, there was a high rate of responses which were not applicable. As indicated in Figure 7.33, 250 or nearly 68% of respondents did not believe this question applied to their situation. Of the remaining responses, 43 disagreed and 32 strongly disagreed meaning that over 20% of respondents either agreed or strongly agreed that there were difficulties accessing e-mail. 27 agreed and 17 strongly agreed with the statement, meaning that nearly 12% either agreed or strongly agreed that accessing e-mail can be a difficult process with speech software. Again, the

response for these questions suggests that the level of difficulty will vary on a case-by-case basis.

Instant Messenger Software Useful

		Frequency	Percent
Valid	NA	225	61.0
	Strongly Disagree	23	6.2
	Disagree	17	4.6
	Agree	53	14.4
	Strongly Agree	51	13.8
	Total	369	100.0

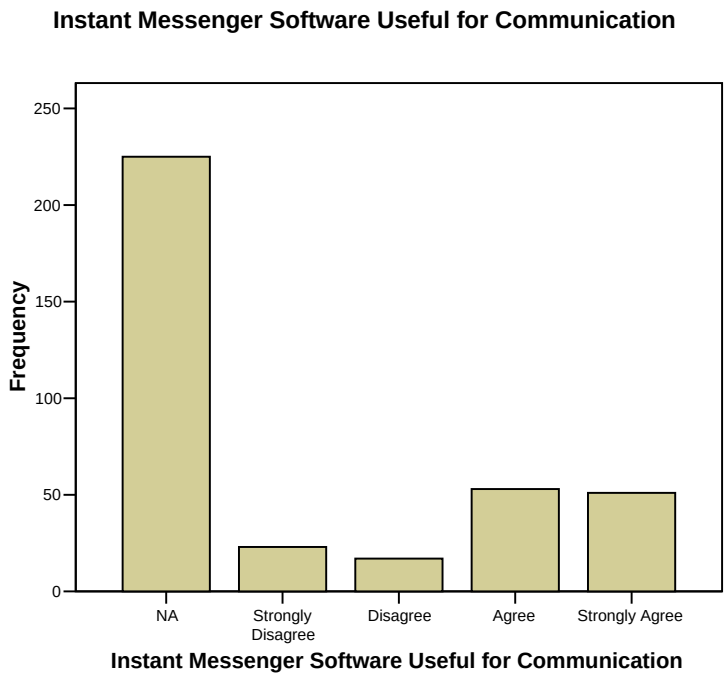


Figure 7.34 Table and bar graph of Instant Messenger use for respondents

Question 32 explored the importance of other Internet communication tools such as instant messenger services. As noted in Figure 7.34, 225 respondents or 61% indicated that this question was not applicable. This verified that a majority of people with vision disabilities do not use this communication tool. Of the remaining 144 respondents, 104 either agreed or strongly agreed with the usefulness of Instant Messenger in keeping in touch with family and friends.

Internet Users Treated Differently With Disability

		Frequency	Percent
Valid	NA	227	61.5
	Strongly Disagree	54	14.6
	Disagree	58	15.7
	Agree	22	6.0
	Strongly Agree	8	2.2
	Total	369	100.0

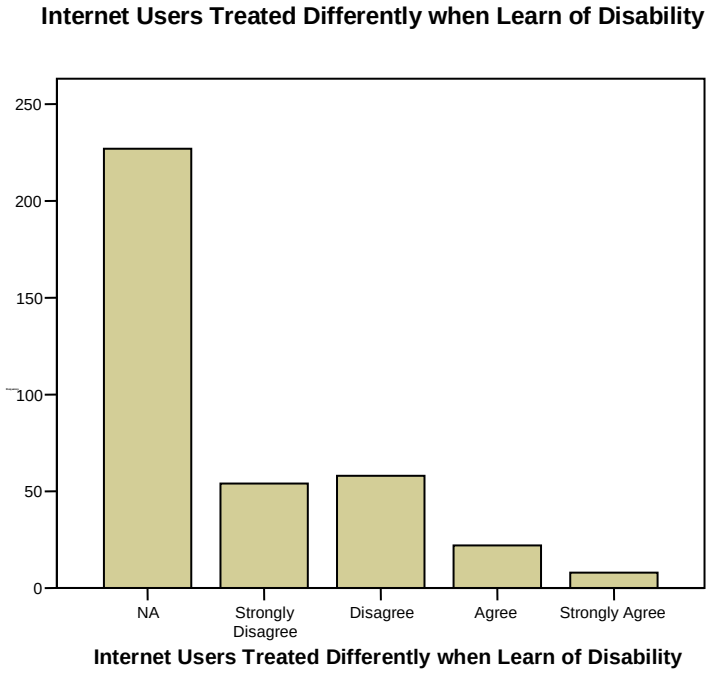


Figure 7.35 Table and bar graph of Internet users treat differently due to Disability for respondents

Question 33 asked if Internet users treated the respondent differently when they discovered the respondent has a disability. As indicated by Figure 7.35, 227 or 61.5% of respondents stated that this question was not applicable. Out of the remaining 122 respondents, 112 either disagreed or strongly disagreed with this statement, suggesting that the respondents believed that their disability provided no significant barrier to online communication. Only 30 respondents either agreed or strongly agreed with this statement.

Support for Disability from Others Online

		Frequency	Percent
Valid	NA	239	64.8
	Strongly Disagree	13	3.5
	Disagree	12	3.3
	Agree	64	17.3
	Strongly Agree	41	11.1
	Total	369	100.0

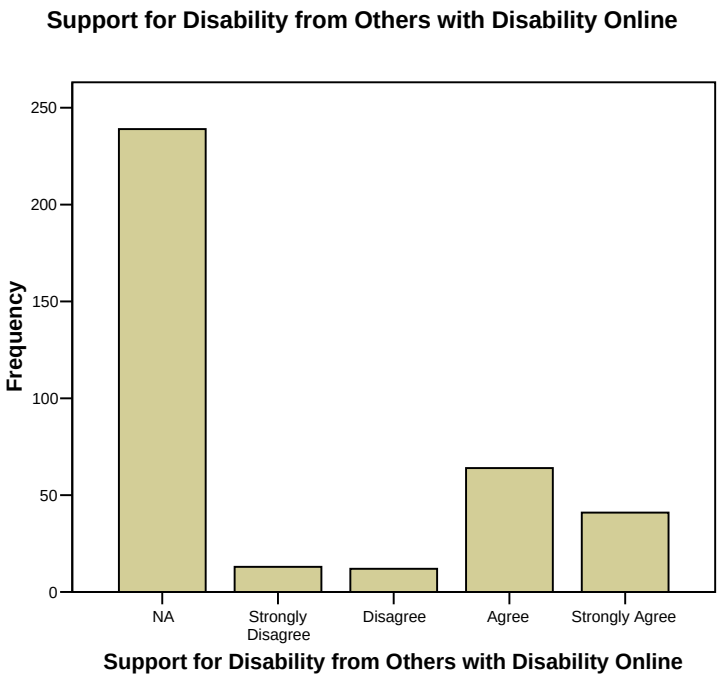


Figure 7.36 Table and bar graph of support for disability from others with a disability online for respondents

The purpose of question 34 was to determine if people with disabilities could gain support for their disability online. As noted by Figure 7.36, there were again 239 respondents or nearly 65% who did not believe this question was applicable and therefore did not participate in online discussion. However, out of the remaining 130 respondents 105 either agreed or strongly agreed with this statement. This indicated that a vast majority of users who participate in online discussion find support for their disability online from others with a disability. Only 24 respondents disagreed or strongly disagreed with this statement.

Able-bodied Internet Users Understand Internet use

		Frequency	Percent
Valid	NA	197	53.4
	Strongly Disagree	50	13.6
	Disagree	69	18.7
	Agree	40	10.8
	Strongly Agree	13	3.5
	Total	369	100.0

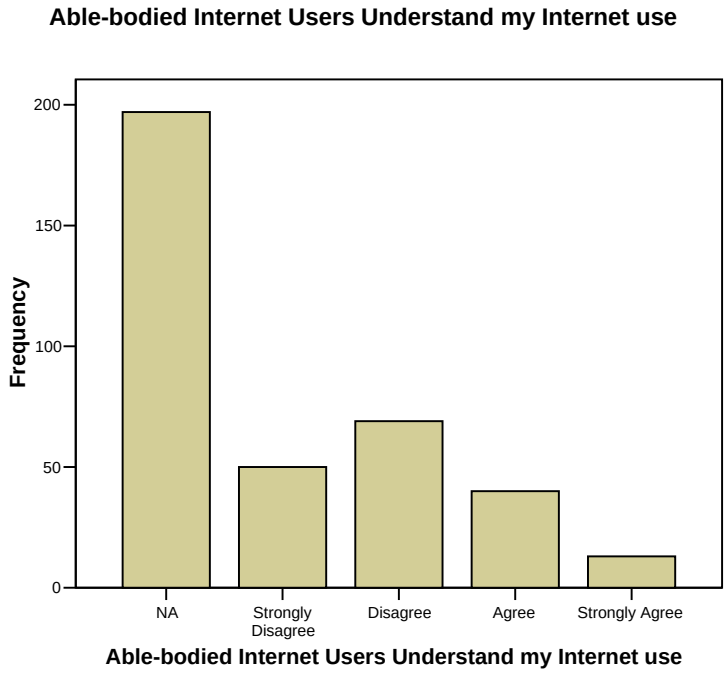


Figure 7.37 Table and bar graph for able-bodied Internet users understanding Internet use for respondents

Question 35 asked if the respondents believed that Internet users who did not have a disability have a good understanding of how a person with a disability uses the Internet. Figure 7.37 notes that there were still a large number of respondents, 197 or a little over 53% who did not perceive this question to be applicable to their situation. However, there was a notable move away from this response in comparison to the last few questions. This may be due to the more generalised nature of this question as opposed to communication-specific questions.

Disability would be more Difficult without Internet

		Frequency	Percent
Valid	NA	118	32.0
	Strongly Disagree	25	6.8
	Disagree	40	10.8
	Agree	86	23.3
	Strongly Agree	100	27.1
	Total	369	100.0

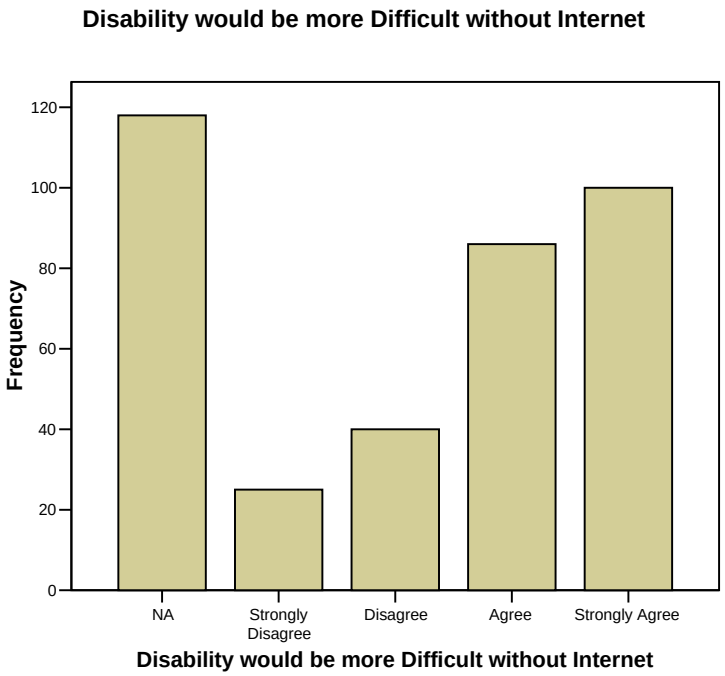


Figure 7.38 Table and bar graph for disability would be more difficult if not for the Internet for respondents

Question 36 asked the respondent if life would be more difficult as a result of having a disability if it were not possible to use the Internet. The results of this question, as displayed in Figure 7.38, were remarkably different from those from previous questions. The number of respondents who answered not applicable was 118 or 32% of the total. The largest response was from the 100 respondents or over 27% who strongly agreed with this statement and the 86 or over 23% who agreed with the statement. Over 50% either agreed or strongly agreed as opposed to only a little under 17% who either disagreed or strongly disagreed.

Internet Offers Nothing and do not Use It

		Frequency	Percent
Valid	NA	141	38.2
	Strongly Disagree	125	33.9
	Disagree	61	16.5
	Agree	27	7.3
	Strongly Agree	15	4.1
	Total	369	100.0

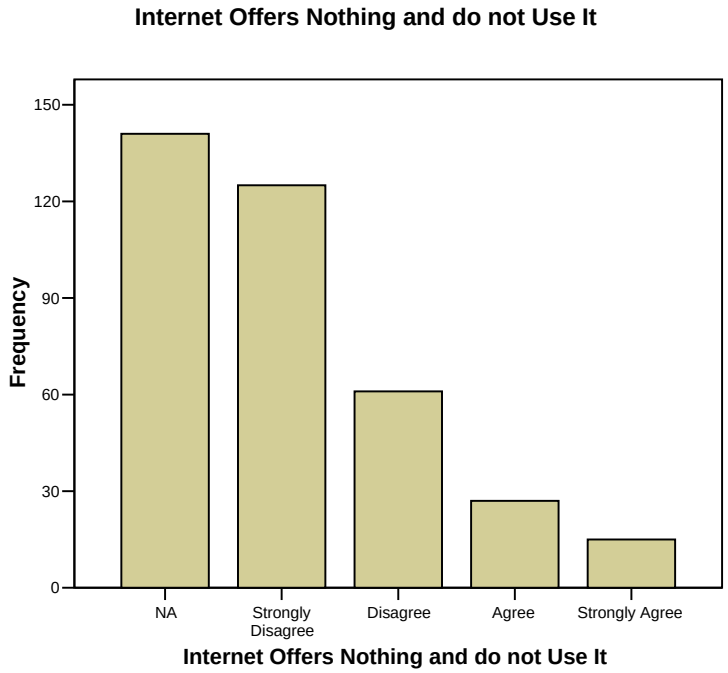


Figure 7.39 Table and bar graph for no Internet use for respondents

The final question of this section, question 37, asked the respondent if they do not use the Internet because they gain nothing from it. As noted in Figure 7.39, there were 141 respondents or a little over 38% who answered not applicable and 125 or nearly 34% who strongly disagreed with the statement. A further 61 disagreed with the statement and only 42 either agreed or strongly agreed with the statement. This verifies that the Internet is deemed to be an important tool to those who use it.

7.4.4 Respondents' views of government and corporate assistance

Section D examines the views of respondents in relation to government and corporate issues discovered during research for this thesis and the interviews discussed in chapters 4, 5, 6 and 7.

Government Websites Good for Respondents

		Frequency	Percent
Valid	NA	103	27.9
	Strongly Disagree	38	10.3
	Disagree	100	27.1
	Agree	111	30.1
	Strongly Agree	17	4.6
	Total	369	100.0

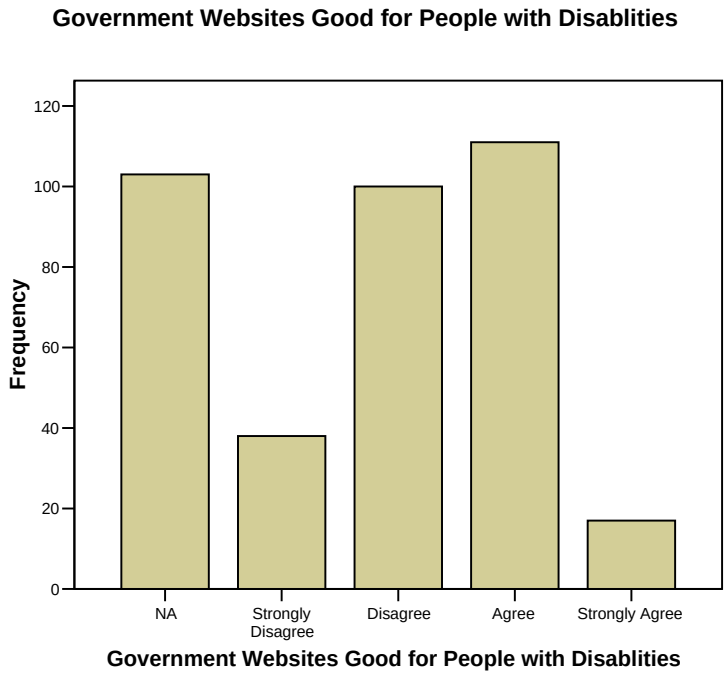


Figure 7.40 Table and bar graph of government web sites good for respondents

The first question in this section, question 38, asked if the respondent believed that the government had done a good job in making its web sites and associated technologies accessible to people with disabilities. As noted in Figure 7.40, there were 111 or a little over 30% of respondents who agreed with this statement whilst 100 or a little over 27% disagreed. The extremities for this question are fairly low with only 17 respondents who strongly agreed and 38 who strongly disagreed. 103 or nearly 28% found this question to be not applicable.

Prefer Internet for News over Other Mediums

		Frequency	Percent
Valid	NA	80	21.7
	Strongly Disagree	64	17.3
	Disagree	133	36.0
	Agree	60	16.3
	Strongly Agree	32	8.7
	Total	369	100.0

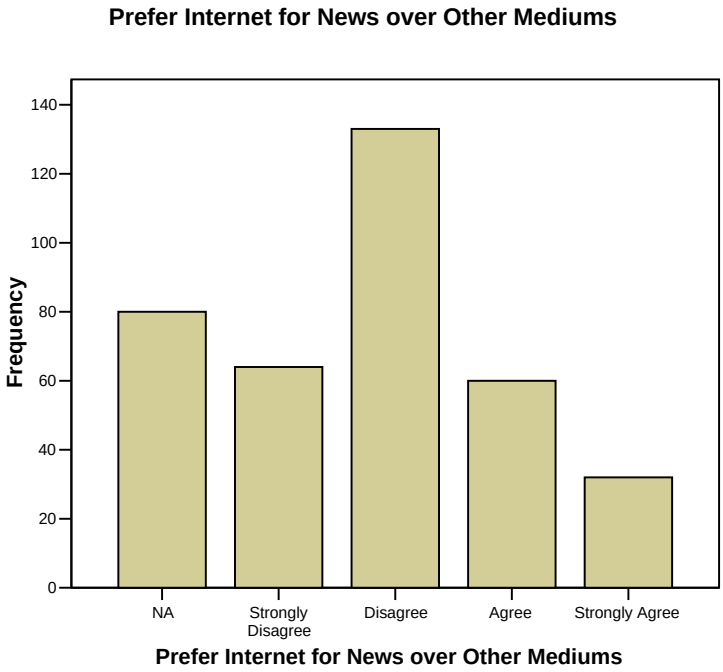


Figure 7.41 Table and bar graph of preferring Internet news over other media for respondents

Question 39 asked if the respondents preferred to find news and media-related information through the Internet rather than through other mediums. As noted in Figure 7.41, 133 or 36% of respondents disagreed and 64 or a little over 17% strongly disagreed, meaning that over 53% of those surveyed do not prefer the Internet as a news medium. Only 60 respondents agreed, 32 strongly agreed and 80 perceived this question to be not applicable.

Able to find News websites but not Content on Page

		Frequency	Percent
Valid	NA	133	36.0
	Strongly Disagree	22	6.0
	Disagree	83	22.5
	Agree	102	27.6
	Strongly Agree	29	7.9
	Total	369	100.0

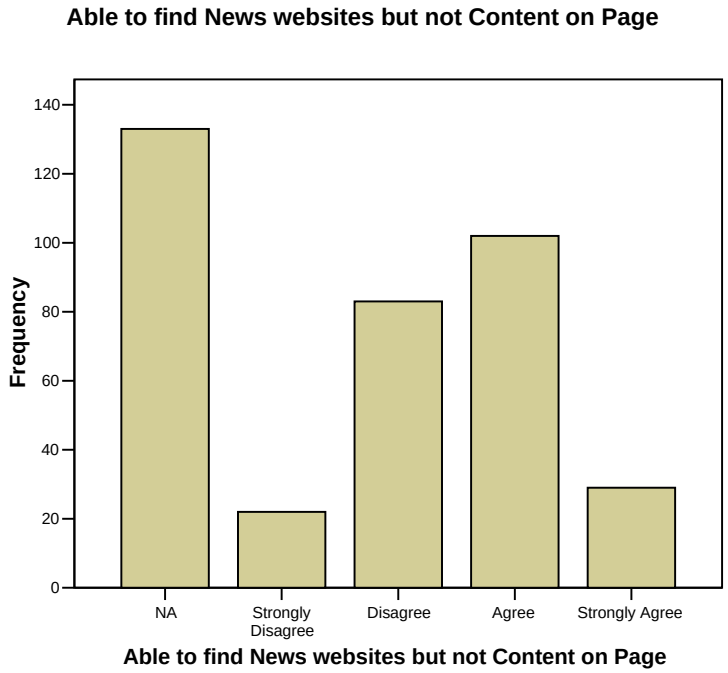


Figure 7.42 Table and bar graph of finding news web site but difficulty finding content for respondents

Question 40 examined whether the respondent was able to locate news and similar web sites easily but found it difficult to access specific articles on those web sites. This question may also be a determining factor in the results of the previous question. As noted in Figure 7.42, the highest response for this question was that the question was not applicable to 133 or 36% of respondents. This result is notably higher than the last question and may suggest that a number of respondents do not search for news articles. In terms of accessibility issues, the results again confirmed that access to news and media web sites are similar to non-news and media web sites in that the accessibility varies greatly. There were a slightly higher number of those who found access to particular news information difficult with 102 or nearly 28% of

respondents who agreed with the statement as opposed to 83 or 22.5% who disagreed with the statement.

Makers of OS Undersatnd what respondents need

		Frequency	Percent
Valid	NA	71	19.2
	Strongly Disagree	72	19.5
	Disagree	121	32.8
	Agree	92	24.9
	Strongly Agree	13	3.5
	Total	369	100.0

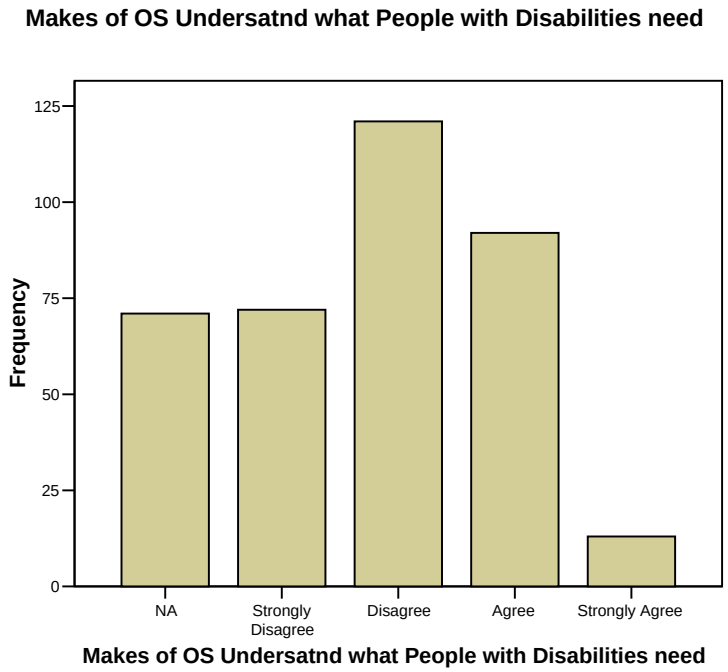


Figure 7.42 Table and bar graph showing makers of OS understand what is needed from technology for respondents

Question 41 asked the respondents if they believed that makers of computing operating systems have a good understanding of what people with disabilities need to access computers. The result for this question confirmed that a majority of respondents did not believe that the makers of operating systems have a good understanding of what people with disabilities need from technology. As demonstrated in Figure 7.42, 121 or nearly 33% of respondents disagreed that makers of operating systems have a good understanding and a further 72 or 19.5% strongly disagreed meaning that over 53% disagreed with this question. There were

92 respondents who agreed and a further 13 who strongly agreed with 71 who perceived this question not to be applicable.

Design of Computer Itself could be Improved

		Frequency	Percent
Valid	NA	71	19.2
	Strongly Disagree	29	7.9
	Disagree	110	29.8
	Agree	117	31.7
	Strongly Agree	42	11.4
	Total	369	100.0

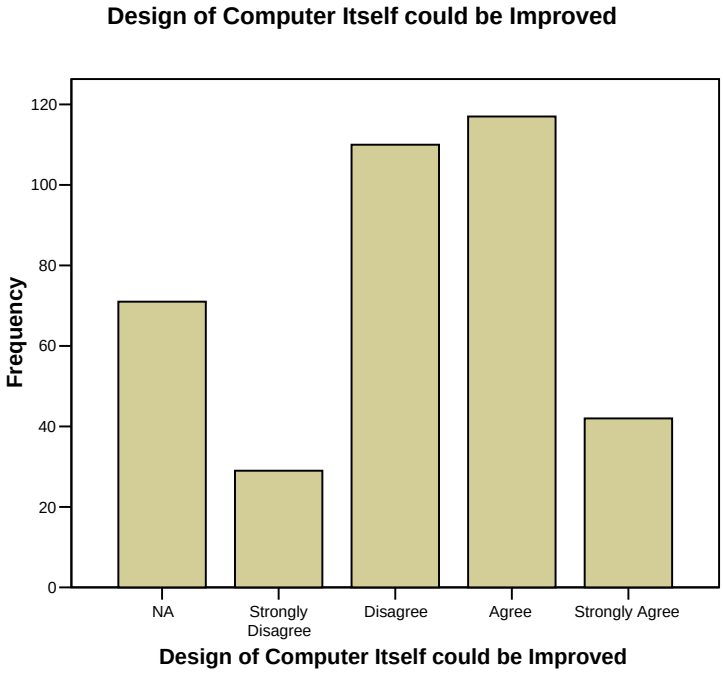


Figure 7.43 Table and bar graph showing design of computer could be improved for respondents

Question 42 focused on whether or not the design of a computer, such as the box, the keyboard or the mouse, could be improved to help the respondent use the computer more effectively. As noted in Figure 7.43, the highest response was agree with 117 or a little under 32% but there were 110 or nearly 30% who disagreed with the statement. There were also 42 who strongly agreed and 29 who strongly disagreed. There were 71 respondents who felt this question was not applicable.

Cost Prevents Use

		Frequency	Percent
Valid	NA	124	33.6
	Strongly Disagree	33	8.9
	Disagree	90	24.4
	Agree	65	17.6
	Strongly Agree	57	15.4
	Total	369	100.0

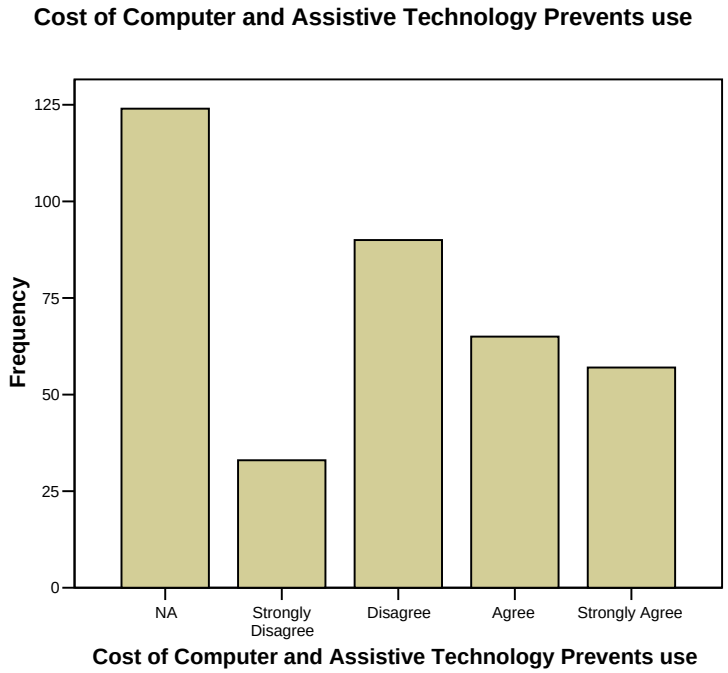


Figure 7.44 Table and bar graph of cost providing access to computing for respondents

Question 43 asked the respondent if the cost of assistive technology, on top of the cost of a new computer, was preventing the use of a computer. As noted in Figure 7.44, there were 90 or a little over 24% who disagreed with this view and 33 or a little under 9% who strongly disagreed. There were also 65 or a nearly 18% who agreed and 57 or a little over 15% who strongly agreed. Overall there was over 33% who either disagreed or strongly disagreed as opposed to 32% who either agreed or strongly agreed. There was nearly 34% who felt the question was not applicable.

Internet would be too Hard without Help

		Frequency	Percent
Valid	NA	84	22.8
	Strongly Disagree	61	16.5
	Disagree	97	26.3
	Agree	88	23.8
	Strongly Agree	39	10.6
	Total	369	100.0

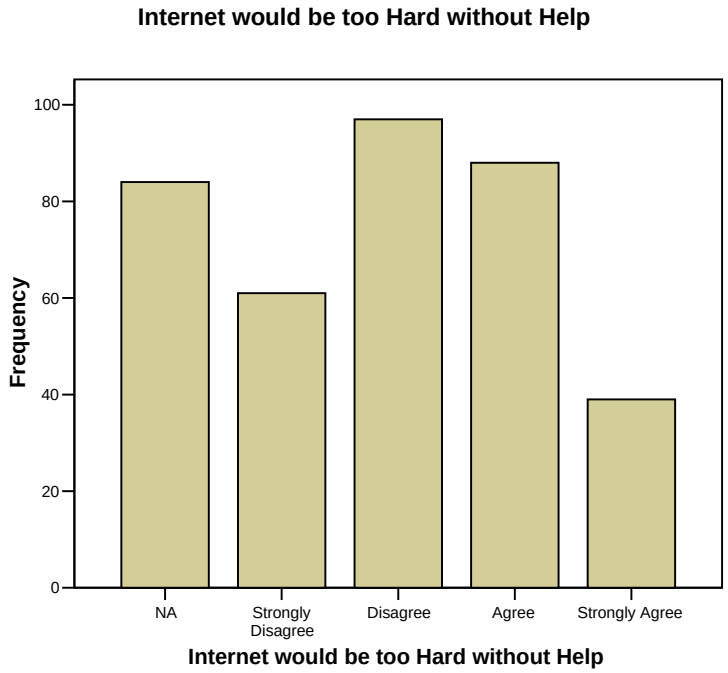


Figure 7.45 Table and bar graph of Internet would be too hard without help for respondents

Question 44 asked the respondents if using the Internet would be too hard if there were not people to provide support. As demonstrated in Figure 7.45, 97 or a little over 26% of respondents disagreed with the statement with 88 or nearly 24% of respondents agreeing that help was required. There were 61 respondents who strongly disagreed and 39 who strongly agreed with the statement. There were 84 who perceived this question not to be applicable.

Assistive Technology is easy and Self-Taught use

		Frequency	Percent
Valid	NA	155	42.0
	Strongly Disagree	51	13.8
	Disagree	74	20.1
	Agree	71	19.2
	Strongly Agree	18	4.9
	Total	369	100.0

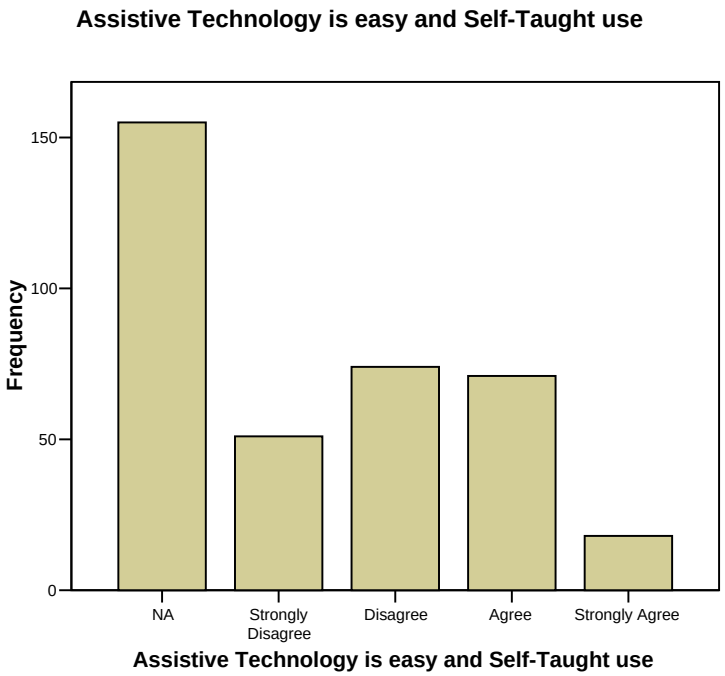


Figure 7.46 Table and bar graph of Assistive Technology is easy and self-taught for respondents

The final question of the survey, question 45, asked if learning how to use AT was a simple process that was mastered by the respondent. As noted in Figure 7.46, 155 or 42% of respondents perceived this question to be not applicable which is consistent with those who do not require assistive technology. There were 74 or a little over 20% who disagreed with the question and 71 or a little over 19% who agreed. The main difference came from the extremities with 51 who strongly disagreed as opposed to 18 who strongly agreed. Overall nearly 34% either disagreed or strongly disagreed as opposed to a little over 24% who agreed or strongly agreed.

7.4.5 Open-ended comments

The Comments section of the survey, Section E, allowed the respondents to comment in their own terms on how home computing, the Internet or how AT could be improved. Many of the comments from the respondents confirmed the broad survey results in that people with vision disabilities had a strong desire to use computers and the Internet, yet were denied due to the issues of government policy, the provision of information and the provision of OS and application issues based on corporate policy.

In addition, the comments made by respondents indicates how minor improvements to the OS or application framework could make a significant difference to computing and Internet access, and go on to explain that if further research were done in this area, there would be significant disability-specific potential for people who wish to use the Internet. It could also provide the opportunity for those who are yet to embrace such technologies to discover the benefits.

In relation to government policy and the provision of online information, a number of respondents commented on the need for a Federal-based Section 508-style policy in which the government could ensure that accessibility initiatives were required by all when products are sold to the Australian government. One respondent indicated that this could be implemented as a part of the DDA, transferring the power from the states to ensure that products purchased by the government were accessible and all information provided by the government was accessible.

The availability of online information proved to be difficult task by many respondents. One Internet user commented that, despite the use of AT, "…my totally blind partner is prevented from accessing information on the Internet which can not be interpreted by JAWS."

In relation to corporate policy, most of the respondents who left comments were generally very critical of the way in which corporations make decisions regarding the lack of consultation with people with disabilities. One respondent

commented that "…computer companies could better learn from people with disabilities by employing them to work on adaptive technology in house instead of designing technologies for disabled people by able bodied people."

The cost of AT was another significant issue for respondents, believing that the corporate pricing policies were denying access to vital equipment needed for computing and Internet access. One respondent indicated that a price reduction on AT would be helpful, but even more helpful would be the provision of free product upgrades. Another respondent confirmed this by stating that they do not upgrade their product due to the cost and dozens of others commented that the initial price of most AT products was prohibitive in allowing the use of a computer.

Other respondents commented on the issue that the assistive tools required were not integrated into the OS. One respondent commented that "…if assistive software was part of every computer when manufactured this would greatly reduce the cost of purchasing an accessible computer." The argument extends beyond pricing, with one respondent stating that the time required to download updates, even if free, is annoying and time-consuming.

Another point of criticism was that AT products such as JAWS are always having to catch up to mainstream technology rather than being instantly able to support mainstream innovation. The respondent stated that any corporate policy should be bound by International law to ensure that any new technology features are made accessible to people with disabilities.

Although a vast majority of comments were about unhelpful corporate policy, there were many comments praising the initiatives of Apple in their development of a full zooming program in the OS and, at this time, the rumoured development of the text-to-speech screen reader which was later released in Mac OS 10.4. Several respondents commented on their support for Apple in providing effective accessibility tools in their OS, stating that Apple "...has better accessibility options built-in" and several respondents stated they would consider changing to Apple if the screen reader were to be effective.

There were also a number of comments regarding training in the use of AT and the support provided by the AT corporations. Many commented that the knowledge held by the teachers of AT was inadequate and that there needed to be a better relationship between the teachers and the producers of AT products. One respondent commented that it is very difficult to get training in the products, stating that "the training available for assistive technology could be better."

In terms of improving the current OS and AT framework, there were many practical concerns from respondents. Ideas included reversing the colour of the mouse arrow to oppose the background colour, more flexible screen magnification software and ongoing improvements to the accessibility of PDF files. One respondent believed that having lessons in how to use an AT product by the manufacturer would be highly beneficial in ensuring access to the product.

The largest number of comments regarding product-specific issues concerned JAWS. Many respondents believed that JAWS was largely ineffective, with one respondent stating that "JAWS is not currently good enough to allow library research…" indicating that there is always a need for help. Another respondent indicated that the developers of AT technologies such as JAWS need to be more pro-active in keeping up with the emergence of new computing technologies.

Many respondents also expressed their frustration with existing AT products. One respondent provided an insight into the opinions of many through this statement: "I have heard a lot about assistive technology that is available to me. I have even tried to learn how to use zoom text and artic voice software, but it has done nothing but stress me out (either I couldn't understand what was being said, or I could not get the mouse pointer to go where I wanted it to go.)"

Respondents also commented on the need for research in this area. One respondent commented that "through a greater understanding of the extent to which peoples' disabilities affect their use + the availability/ accessibility of computer technology! greater research needs to be completed!". Other respondents indicated that more funding should be placed into disability-related IT research and that

funding should continue until there is equity in the access of computing and Internet-related technologies.

7.5 Conclusion

Issues that contribute to the disability divide as a result of products and policy are important in addressing the needs of people who are blind and vision impaired. However, the best way of understanding the needs of this disability group is to ask them directly.

In order to gain a large sample group, a survey was deemed to be the most appropriate instrument selection. The provision of multiple survey formats allowed people with varying degrees of vision to participate equally in the study. With the support of blind and vision impaired organisations, the surveys were distributed throughout Australia with a response rate substantial enough to provide a vital insight into this area.

The data collected from the survey confirm that the instrument was effective in conducting a reliable and valid study. This was confirmed by comparing the personal information responses with established data from the ABS and other sources. The comments section also provided additional information adding another opportunity for people who are blind and vision impaired to add their voice directly in expressing their needs from IT.

The following chapter performs a comprehensive analysis of these results, extracting the data which highlight the way in which blind and vision impaired people use computing and Internet-related technologies and some of the issues that they face.

8.0 ANALYSIS OF FINDINGS

8.1 Introduction

The aim of the survey was to find out key issues amongst blind and vision impaired people which are contributing to the disability divide. The lack of consultation between the decision-makers and this disability group has made it difficult to determine specific concerns within their IT experience. This research has aimed to uncover such difficulties.

The analysis of the survey findings takes the data viewed in the previous chapter and identifies key issues which, if addressed, could significantly improve the issues of IT access amongst people who are blind or vision impaired. This chapter shows how this Australia-wide survey has discovered how personal circumstance, educational opportunities, computer usage, Internet usage, government policy and corporate products were factors in contributing to, and potentially removing, the disability divide.

8.2 Intra-Section Survey Analysis

8.2.1 Demographic information

The demographic information gathered in this survey showed that the survey population was largely consistent with the wider disabled population (Australian Bureau of Statistics, 2003a). There was a greater leniency for proportion of older respondents, consistent with the notion that vision loss was more likely to affect older people. Gender distribution was also in line with ABS data for Australia, with a relatively even split between males and females responding to the survey. These data, in conjunction with a good cross-section of ages in the survey sample, provided a reasonably accurate survey sample in relation to the general population. However, as previously discussed, difficulties in the distribution of the survey has resulted in an excess of responses from Western Australia. This bias made it difficult to examine the effects of local issues, or to draw conclusions about different areas of Australia. In relation to the eye condition of the respondents, there was a slight majority of people who had a degenerative eye condition. The ratio of vision

impaired people to blind people within the respondent sample was fairly consistent with that contained in the population as a whole.

As previously discussed in sections 1.7 and 3.3, blind and vision impaired people face significant difficulties because of the interlinked effects of lower rates of employment, poverty and a lack of educational opportunities. The data retrieved in the survey showed that the survey sample suffered similar problems and that they contributed significantly to the disability divide. The data regarding employment status showed a significant result in particular. 53% of the respondents were either unemployed or retired. In order to verify only the unemployment rate, it was necessary to separate the working age group from the retired age group. This has been achieved through a cross tabulation analysis of the age and employment categories.

Age * Employment Status Crosstabulation

Count

		Employment Status				Total
		Full-Time	Part-Time	Casual	Unemployed/Retired	
Age	18-24	7	5	7	14	33
	25-34	23	7	2	16	48
	35-44	21	14	4	21	60
	45-54	18	19	9	41	87
	55-64	10	6	14	46	76
	65+	1	3	2	59	65
Total		80	54	38	197	369

Figure 8.1 Table of age and employment status for respondents

Thus, 94 out of 228 respondents aged between 18 and 54 inclusive, or over 41% of working-age respondents were unemployed. As noted in Figure 8.1, this percentage was higher than the figures discussed earlier in sections 1.7 and 3.3 but it verified that people who were blind or vision impaired face a higher rate of unemployment than the able-bodied population.

In addition, the income levels of blind and vision impaired people were very low. Nearly 40% of respondents were earning less than $15,000 which suggested the blind disability support pension was the sole means of income. In order to gain a better understanding of income levels, it was important to view only the income

levels of the working population. A comparative analysis was performed between the age and income responses to produce the required results.

Age * Income Crosstabulation

Count

		Income						Total
		<$15000	$15,001-$25,000	$25,001-435,000	$35,001-$45,000	$45,001-$60,000	$60,000+	
Age	18-24	17	8	3	1	0	0	29
	25-34	16	3	8	9	8	4	48
	35-44	22	9	9	3	4	13	60
	45-54	34	18	10	7	12	5	86
	55-64	32	11	11	4	9	7	74
	65+	23	20	11	5	1	5	65
Total		144	69	52	29	34	34	362

Figure 8.2 Table of age and income levels for respondents

As shown in Figure 8.2, out of the 223 people who were of working age, there were 89 or nearly 40% who had an income below $15,000. These data were consistent with the research discussed earlier in sections 1.7 and 3.3 and people who were blind or vision impaired clearly do face significant poverty-related issues.

The third significant issue related to the educational opportunities provided to blind and vision impaired people. As indicated in the survey figures, over half of the respondents have not completed any tertiary education. Furthermore, over three quarters of the respondents were not undertaking any study at the time. A lack of education reinforces low income and poor prospects of employment.

The issues of poverty, unemployment and a lack of educational opportunities were a significant disability divide issue. In mainstream society, the use of computers and the Internet can still be accessed despite having a low income. Internet cafes, for example, offer a low cost option for Internet usage, and public libraries also offer Internet resources. However, these resources were not available to people with vision disabilities due to the lack of AT equipment and the accessibility issues discussed earlier in this thesis. As identified in chapters 2 and 3, the hope of the Internet, which can offer assistance in terms of seeking employment and educational interaction, was also therefore denied. Essentially, this survey result confirmed that poverty, unemployment and a lack of educational opportunities were crucial issues that need to be addressed if the disability divide is to be resolved.

8.2.2 Computing and assistive technology knowledge

The data regarding computing access for blind and vision impaired people demonstrated that there was a significant difference between the conceptual understanding of computing and the ability to interact easily with a personal computer. In addition, the lack of awareness of AT products and the difficulties in using the products suggested that there were some issues regarding the accessibility of current AT products which may have contributed to the disability divide.

Over 83% of respondents were familiar with the Microsoft Windows OS and nearly 80% had an understanding of computing hardware concepts. Approximately 79% of respondents possessed both a knowledge of computers and the ability to use a computer, which ranged from fair to expert. In addition, 76% of respondents agreed or strongly agreed that they were comfortable using a computer. These figures would suggest that, for the surveyed population, the knowledge, use and comfort level of computers did not contribute significantly to their experience of the disability divide

The knowledge of AT products in general was, by comparison, significantly less. Only approximately half of the respondents had an awareness of screen magnification products, and even less were aware of other products. Only approximately 54% of respondents rated their knowledge of AT concepts from fair to expert. Unlike the question regarding computer knowledge and use, there were differences in the results between understanding and using AT. The ability to use AT decreased somewhat, with a little over 48% rating their abilities from fair to expert. The ‘none’ and ‘poor’ categories received the largest responses to this question. Yet a little over 60% of respondents agreed or strongly agreed that they needed AT in order to use a computer. The survey results suggested that the effectiveness and ability to use the accessibility tools in the OS or AT products were a significant factor of the disability divide.

The significance of accessibility tools in the OS is verified by the data concerning the colour scheme and the accessibility tools built into the OS. Although

the colour scheme question received a large number of not applicable responses, more than 75% of those that did respond agreed that this was an important feature. The responses concerning accessibility tools in the operating system presented a similar view with a high number of not applicable responses, but amongst those who responded, a vast majority agreed or strongly agreed. Such data emphasised the necessity of and value in having accessibility features in the OS.

Respondents' attitudes towards new technologies revealed that a vast majority of those surveyed either only upgraded their computing technology when it was absolutely necessary or waited for advice before upgrading. This result illustrated that manufacturers need to ensure that AT products address the needs of people who were blind or vision impaired without the need for regular updates. Given the survey results about the difficulties with AT, it is likely that the reluctance to upgrade was due to the difficulty in understanding the process. Essentially, these survey results identified that the knowledge and familiarity with computing remained prevalent amongst blind and vision impaired computer users, but the accessibility tools in the OS or the AT products were not effectively providing access due to their complexity or ineffectiveness.

8.2.3 Internet knowledge

The results from the section of the survey that sought information on respondents' Internet knowledge suggested that blind and vision impaired people had a good understanding of Internet concepts. However, there were disability divide issues based on the awareness of some Internet tools, AT effectiveness and web accessibility. The high rate of web and e-mail familiarity, nearly 83% and a little over 70% respectively, indicated that most respondents were aware of the basic communication and information aspects of the Internet. These results indicated that being blind or vision impaired does not make people uninterested in, or completely unable to use, the key functions of the Internet. The familiarity of respondents with the Internet was confirmed in the questions relating to knowledge of Internet concepts and the use of the Internet. Over 70% of those who responded to this survey had some understanding of the Internet. The figures relating to the use of the Internet showed a slight increase in the number of people who were unable to use the

Internet but, generally speaking, the number of people who conceptually understand the Internet and those who were able to use it were similar. However, more advanced Internet applications, such as mailing lists, newsgroups and real-time chat, were only familiar to one-third of the respondents.

Thus, two significant issues emerged here in relation to the disability divide. Firstly, blind and vision impaired users' level of understanding was significantly less than that of computing concepts. This finding suggested that there were accessibility issues which prevented access to the Internet which did not of themselves limit access to personal computing as a whole. Secondly, the familiarity of users with Internet applications was rather more limited than all users, indicating that some applications which can be specifically beneficial to people with disabilities, such as mailing lists and real-time chat, were not available to them.

The accessibility issues faced by people who are blind or vision impaired were reflected in many questions from this section demonstrated by the extremities in the response patterns. For example, the use of OS-based accessibility tools and third-party AT devices showed that respondents were divided in their views. Respondents largely ignored the extreme viewpoints of strongly agree and strongly disagree, and chose instead to select the less extreme views. Furthermore, the number who agreed or disagreed were very similar. This suggested that the success of AT when using the Internet was largely a hit-and-miss affair, with AT being effective on some occasions and ineffective for others. In regards to overall AT usage, this result may have indicated that much of the AT equipment and OS accessibility tools currently available did not effectively provide assistance to people who were blind or vision impaired, or that the group was not familiar with products which could have proved beneficial, or that a link had not yet been made between assisted computer use and the Internet. These possibilities were supported by the research discussed in earlier chapters regarding the accessibility issues of online information and in the survey results of the previous section.

The survey also suggested that the provision of online information was another divided issue amongst respondents as there was a lack of extreme views.

Respondents were fairly evenly spread across all categories in terms of whether disability-related issues prevented Internet access. There were, however, stronger views regarding the interaction between able-bodied Internet users and people who were blind and vision impaired. Although for most of these questions the 'not applicable' answer was notably high, the respondents with views indicated that, generally speaking, the able-bodied population did not treat respondents differently when their disability was revealed. However, respondents did not believe that able-bodied Internet users had a good understanding of how they used the Internet. Such results again confirmed that web accessibility was a significant issue but one that varied depending on the web page. However, the combination of issues with AT and issues with web accessibility, combined with a lack of understanding by those designing web sites, made this a major factor of the disability divide.

In addition to information provision, another key area revealed by the survey was the significance of communication. The data reveal that most respondents believed that e-mail was a simple form of communication for blind and vision impaired people. Nearly 48% of respondents strongly agreed with this statement with a further 30% agreeing. Such a polarised view contrasts significantly with the much lower agreement with statements on locating information on the Internet, suggesting that e-mail provided a relatively accessible service. The only indicator which suggested that there may have been difficulties with e-mail was regarding the use of AT to access e-mails. Again there was a notable lack of extremities and fairly even results for both sides, suggesting that the AT used to read e-mails varied significantly in success on a case-by-case basis.

Although e-mail communication was deemed to be necessary, the results regarding real-time communication suggested that it was a tool that, despite being largely unfamiliar to blind and vision impaired people, was vital in providing disability-specific support. The question relating to the use of real-time communication showed that there was an extremely large 'not applicable' response rate of 61% due to the large unfamiliarity of real-time chat applications. However, over 72% of the remaining responses believed that it was a useful communication tool. The results were similar in relation to communication being beneficial for disability-related support. The high popularity of this product by users suggested

that the Internet had the potential to be far more beneficial to people with vision disabilities than was currently available. The people who had discovered real-time communication were gaining significant benefits from the Internet in terms of disability-specific support, yet surprisingly, most people surveyed were not even aware of Internet tools and resources beyond the WWW and e-mail. Therefore, the denial of such important disability-specific support was another key issue of the disability divide

Essentially, the survey results indicated that blind and vision impaired people had a good conceptual understanding of the Internet as an information and communication tool but there were factors contributing to the disability divide which were preventing full access to the benefits the Internet can provide. One key factor was due to the complexity or lack of effectiveness of AT, which, in combination with web accessibility issues, prevented access to online information. In relation to communication, e-mail was seen as an effective resource but real-time communication, one of the most benefited disability-specific support tools according to those that use it, was largely unfamiliar to the survey respondents.

8.2.4 Government and corporate views

The questions in this section were designed to compare the computing and Internet-related experiences of people who are blind or vision impaired with the perception of experience from those in government or corporate realms. The results of the survey have identified key differences between the views gathered during the interview process with people within these areas and the views held by people with vision disabilities.

The survey results confirmed that people with vision disabilities generally believed that the government did not have a good understanding of the needs of people with vision disabilities. Such views may have been based on the accessibility issues associated with some government web sites, as discussed earlier in section 5.2. This view was strengthened when survey results of government web sites were compared to the general accessibility issues discussed earlier. Respondents generally avoided extreme views and there was a slight bias towards a negative view. This

result indicated that it is likely that people with vision disabilities did not feel government agencies understood their experiences due to the accessibility issues associated with online information provision.

The perception of corporations by respondents was similar to the perception of government. The survey indicated that a majority of blind and vision impaired people did not believe that corporations had a good understanding of the IT needs of people with disabilities. This may be related to the earlier survey results that suggested that the accessibility tools and AT provided by such corporations were largely ineffective. The historical reoccurrence of the disability divide, highlighted in chapter 3, may also have been a factor. This view contradicted the view held by many of the corporations interviewed. Such a response strengthened the argument that a lack of consultation between the IT corporations and people with vision disabilities has led to a misunderstanding about their knowledge of disability-related computing and Internet experiences.

In relation to the cost of AT on top of a PC preventing the use of a PC, the results were fairly even overall. However, one difference was that the people who agreed that the cost was prohibitive was weighted heavily towards strongly agreed in comparison to the difference between the disagreed and strongly disagreed category. This suggests that the people who were affected by the cost were more definite about their views on this issue than those who were not affected.

The final questions in this section investigated the ease of Internet usage and the amount of assistance that may be required. Again the results were fairly evenly balanced with a slight trend towards disagreement with the question.

This result suggested that although there was a slight trend towards the Internet ultimately being a product that can be used independently, there were still a large number of users who required assistance. This result will be compared with availability of assistance later in the chapter.

Essentially, this section demonstrated that survey respondents perceived government and corporate entities were largely ineffective in understanding the computing and Internet-related experiences of people who are blind or vision

impaired. The difference in perception suggested that the lack of consultation between such groups was a significant factor of the disability divide.

8.3 Group analysis

8.3.1 The identification key indicators

In order to examine the data in further detail, it was necessary to identify key indicators in the data. This assisted in providing more information and in refining previously discovered information in earlier questions. The individual responses to the survey questions have identified that there were key issues regarding poverty, a lack of educational opportunities, the effectiveness of AT and the importance of real-time communication. However, the severity of the disability divide was caused by a combination of factors interacting with each other. Through a thorough comparative analysis, key indicators have been established which endeavour to explain the occurrence of the disability divide and bring to the forefront ways to address these issues.

The first key indicator was to determine if the level of IT expertise, in conjunction with other factors, was an issue in the disability divide. This was a highly significant question as it endeavoured to discover whether people with vision disabilities were unable to participate in IT due to a lack of expertise or if there were other factors preventing their participation. The results of this question determined the focus of a disability divide solution - whether education in computing and Internet-related technologies alone was necessary or whether there were other factors that needed to be addressed. In order to examine this key indicator, a new category was formed from the results of the questions relating to the knowledge and use of computing and the Internet. This has been achieved by combining the data from four questions the knowledge of computing, the use of computing, the knowledge of the internet and the ability to use the Internet. This ‘super category’ has then been compared with other survey data.

The second key indicator was the level in which respondents felt comfortable in using a computer. This indicator was vital in determining which products and services affected the way in which people who were blind or vision impaired were

able to interact with computing and Internet-related technologies. Products compared with comfort levels included the need for AT, the ease of use of AT and accessibility issues with web sites. This indicator followed up on the inference of the previously discussed survey results by determining how the use of AT and web accessibility contributed to the disability divide.

The third key indicator was determining the impact of issues which have already been identified as factors contributing to the severity of the disability divide. These indictors consisted of the impact of cost and the significance of education. Sections 1.7 and 3.3 of this thesis, in conjunction with the survey results discussed earlier, have highlighted the significance of low income preventing IT access and the potential denial of educational opportunities. This indicator explored the relationship between these elements and how they contributed to the disability divide.

The final key indictor is designed to determine if disability-related issues prevent access to the Internet. This question goes to the heart of the study and is vital in determining what were the perceived difficulties in gaining access to computing and Internet-related technologies. As discussed at the beginning of chapter 1, the interaction of people with disabilities in society is always changing and has had a profound impact on the welfare of people with disabilities. This indicator examined how computing and Internet-related technologies are perceived and if that perception is a factor in the disability divide.

8.3.2 Respondents with expertise in Information Technology

The initial analytical comparison that needs to be made was between the level of IT expertise and the personal data collected from the survey.

Ability to Understand and Use a Computer and the Internet * Age Crosstabulation

Count

		Age						Total
		18-24	25-34	35-44	45-54	55-64	65+	
Ability to Understand and Use a Computer and the Internet	None	0	0	3	0	12	21	36
	Poor	1	2	6	12	8	16	45
	Fair	5	7	19	25	32	16	104
	Good	15	28	23	42	21	12	141
	Expert	12	10	9	6	3	0	40
Total		33	47	60	85	76	65	366

Figure 8.3 Table of age and IT expertise for respondents

Ability to Understand and Use a Computer and the Internet * Gender Crosstabulation

Count

		Gender		Total
		Male	Female	
Ability to Understand and Use a Computer and the Internet	None	15	21	36
	Poor	21	24	45
	Fair	44	60	104
	Good	68	73	141
	Expert	27	13	40
Total		175	191	366

Figure 8.4 Table of gender and IT expertise for respondents

As indicated in Figure 8.3, the respondents in this survey were similar to the mainstream population in that the younger the respondent, the higher the level of IT expertise. In relation to gender, however, Figure 8.4 suggests that there was a notable excess in the level of IT expertise amongst the female respondents. Given the traditional male dominance of the IT industry and the larger response of males to this survey, the result may have suggested that women who used IT worked harder to master IT concepts or that there were currently unknown IT issues amongst blind and vision impaired people which affected males more than females. It may also have been the case that the information and communication aspects of the Internet were of more interest to women.

In relation to employment, there was a notable difference between the IT expertise of people who were employed and people who were unemployed or retired.

Ability to Understand and Use a Computer and the Internet * Employment Status Crosstabulation

Count

		Employment Status				Total
		Full-Time	Part-Time	Casual	Unemployed/Retired	
Ability to Understand and Use a Computer and the Internet	None	1	1	3	31	36
	Poor	6	4	1	34	45
	Fair	21	20	8	55	104
	Good	36	22	22	61	141
	Expert	14	6	4	16	40
Total		78	53	38	197	366

Figure 8.5 Table of employment and IT expertise for respondents

As noted in Figure 8.5, the percentage of people with no or poor IT expertise who were employed in full-time, part-time or casual work was around 10%. For people who were unemployed or retired, the rate was approximately 32%, significantly higher than for those who were unemployed. It appeared likely that the exposure to computing and the Internet in industry which was not available to people who were unemployed or retired. Equally, people who were employed were more likely to have the money to set up and maintain computing and Internet connectivity.

In relation to the stability and nature of vision impairment, there were some notable findings.

Ability to Understand and Use a Computer and the Internet * Vision Stability Crosstabulation

Count

		Vision Stability		Total
		Degenerative	Stable	
Ability to Understand and Use a Computer and the Internet	None	30	6	36
	Poor	29	16	45
	Fair	62	42	104
	Good	78	63	141
	Expert	15	25	40
Total		214	152	366

Figure 8.6 Table of vision stability and IT expertise for respondents

In terms of the none, poor, fair and good categories of IT expertise, people with degenerative eye had similar results proportionally to respondents with stable vision. However, as noted in Figure 8.6, the expert IT respondents numbered approximately 7% amongst people with a degenerative eye condition and over 16% amongst people with stable vision. Furthermore, comparisons between people who

were blind and people who were vision impaired did not present any significant differences. This may have suggested that regardless of vision level, the consistency of vision allowed for a greater opportunity in understanding the Internet.

In relation to education levels, there was a slight trend in the amount of education and an increased knowledge and use of computing and the Internet.

Ability to Understand and Use a Computer and the Internet * Education - Current Crosstabulation

Count

		Education - Current						Total
		Secondary	TAFE Diploma	University Undergrad	University Postgrad	Other	Not Studying	
Ability to Understand and Use a Computer and the Internet	None	0	0	0	0	0	36	36
	Poor	0	1	0	0	1	42	44
	Fair	1	3	2	3	13	81	103
	Good	3	8	8	4	14	101	138
	Expert	1	4	5	4	3	22	39
Total		5	16	15	11	31	282	360

Figure 8.7 Table of current education and IT expertise for respondents

Although there were proportionately similar results for those with education through secondary and TAFE levels, very few at university undergraduate level have no IT expertise and none of those at postgraduate level had no IT expertise. In addition, there was a highly significant result regarding those who were currently studying. As indicated by Figure 8.7, no one who was currently participating in secondary, tertiary or a different type of course claimed to have no IT expertise. Out of all those sampled, aside from one respondent, everyone who was currently undertaking a course, regardless of the type of course, had a fair or better level of IT expertise. This result suggested that, given current dependence on computing and the Internet for education, simply undertaking a course, whether it is or is not computer-specific, would improve the ability of a blind or vision impaired individual to access computing and Internet-related technologies. Other personal factors such as living arrangements and income levels, did not appear to be significant in relation to the level of IT expertise amongst respondents.

In relation to the use of Assistive Technology, the data indicates that in order to effectively use AT, a high level of IT expertise is required.

Ability to Understand and Use a Computer and the Internet * Ability to Use Assisitve Technology Crosstabulation

Count

		Ability to Use Assisitve Technology					Total
		None	Poor	Fair	Good	Expert	
Ability to Understand and Use a Computer and the Internet	None	29	7	0	0	0	36
	Poor	18	20	7	0	0	45
	Fair	22	31	35	16	0	104
	Good	23	31	35	51	1	141
	Expert	3	7	5	16	9	40
Total		95	96	82	83	10	366

Figure 8.8 Table of AT usage and IT expertise for respondents

However, it was not the case that a high level of IT expertise automatically ensured success with AT. As noted in Figure 8.8, each respondent who considered themselves an expert in AT was also a good or expert computing and Internet user. However, 26 respondents who were good or expert computer and Internet users rated their abilities with AT as none or poor.

The comparison between the level of IT expertise with the need for AT presented data which were highly significant in relation to the disability divide.

Ability to Understand and Use a Computer and the Internet * Require Assistve Technology to use a Computer Crosstabulation

Count

		Require Assistve Technology to use a Computer					Total
		NA	Strongly Disagree	Disagree	Agree	Strongly Agree	
Ability to Understand and Use a Computer and the Internet	None	26	0	2	1	7	36
	Poor	7	3	7	15	13	45
	Fair	12	5	12	31	44	104
	Good	23	19	21	44	34	141
	Expert	2	5	3	16	14	40
Total		70	32	45	107	112	366

Figure 8.9 Table of AT need and IT expertise for respondents

As noted in Figure 8.9, a vast majority of good and expert computing and Internet users who used AT agreed or strongly agreed that it was an essential tool. Together these two results demonstrated that although AT is required, a large number of respondents were unable to use it effectively, even those with good or expert IT expertise. This finding suggested that AT products required a degree of complexity somewhat higher than that required by mainstream computer and Internet users and it was thus an issue for blind and vision impaired people. This finding is also supported by the survey open-ended comments, whereby many people specifically

indicated that AT complexity was a significant issue in the prevention of computing and Internet access.

In relation to upgrading, the survey data suggested that there was a pattern between the increase in IT expertise and the desire to upgrade.

Ability to Understand and Use a Computer and the Internet * Attitude Towards Computing Technologies Crosstabulation

Count

		Attitude Towards Computing Technologies				
		Latest Technology	Wait for Advice	Only when Necessary	Do Not Use	Total
Ability to Understand and Use a Computer and the Internet	None	1	0	0	35	36
	Poor	0	1	24	20	45
	Fair	5	33	59	7	104
	Good	44	56	41	0	141
	Expert	23	14	3	0	40
Total		73	104	127	62	366

Figure 8.10 Table of attitude towards upgrading and IT expertise for respondents

As noted in Figure 8.10, the expert users were most likely to upgrade as soon as new computing products were available. The highest number of respondents who were good with IT indicated that they would wait for advice and those with fair or poor IT expertise indicated they would generally upgrade only when necessary. This result highlighted that unless people who were blind and vision impaired increased their level of IT expertise, there was little chance of new products being immediately embraced even if they were potentially beneficial.

Essentially, the analysis relating to IT expertise confirmed several causes of the disability divide. Firstly, these results established that unemployment and a lack of educational opportunities directly contributed to the disability divide. People who were employed generally had a greater understanding of computing and Internet-related technologies and those who were undertaking some form of education had a dramatically improved understating of computing and the Internet. The area of particular interest regarding education was that the learning did not have to be IT-specific given the reliance of society on the use of computers and the Internet.

Secondly, there were significant issues for corporations in the findings that there was a direct correlation between the level of expertise amongst respondents and

that knowledge of IT did not necessarily translate into a knowledge or understanding of AT. This result highlighted the issue of consultation between corporations and people with disabilities. Corporations will continue to fail in meeting the needs of this group until consultation is undertaken to reduce the complexity of AT and ensure that people with vision disabilities have a clear understanding of how such products work. These results also suggested that vision stability was helpful in understanding IT and women were gaining more expertise in IT than men amongst respondents. Put simply, improving the level of IT expertise amongst blind and vision impaired people was demonstrated to be a significant factor in relation to addressing disability divide issues.

8.3.3 Comfort levels of computing and Internet products for respondents

The comfort levels of computing and Internet products were a key indicator in identifying which elements of access were particularly difficult for respondents.

Understand and Use a Computer and the Internet * Comfortable Using a Computer

Count

		Comfortable Using a Computer					Total
		NA	Strongly Disagree	Disagree	Agree	Strongly Agree	
Ability to Understand and Use a Computer and the Internet	None	29	6	1	0	0	36
	Poor	6	11	14	11	3	45
	Fair	2	2	11	70	19	104
	Good	0	1	3	61	76	141
	Expert	0	0	0	3	37	40
Total		37	20	29	145	135	366

Figure 8.11 Table of knowledge and use of computing and Internet and comfort level for respondents

As noted in Figure 8.11, there was a correlation between knowledge about computing and the comfort level of using a computer. Nearly 73% of people with computing and Internet knowledge and who responded in the ‘fair’ or ‘better’ categories were comfortable in using a computer. This compared with earlier individual data and suggested that overall, blind and vision impaired people understood an knew how to use computers and the Internet and were generally comfortable with the mainstream products and services.

The next section examined the relationship between the comfort level of using a computer and the need for AT to use a computer.

Comfortable Using a Computer * Require Assistve Technology to use a Computer Crosstabulation

Count

		Require Assistve Technology to use a Computer					Total
		NA	Strongly Disagree	Disagree	Agree	Strongly Agree	
Comfortable Using a Computer	NA	29	0	1	2	5	37
	Strongly Disagree	3	2	3	4	9	21
	Disagree	3	2	8	7	10	30
	Agree	15	10	20	56	45	146
	Strongly Agree	20	18	13	40	44	135
Total		70	32	45	109	113	369

Figure 8.12 Table of computing comfort level and require Assistive Technology

As indicated in Figure 8.12, being comfortable with a computer did not automatically translate into a reliance on AT. This result suggested that most blind and vision impaired people surveyed viewed a separation between the comfort associated with using a computer and the need for AT. This may be due to a perception that using AT is distinct from the overall experience of using a computer due to its complexity highlighted in previously analysed data.

The next category explored this theme further through the comparison of comfort levels when using a computer and the ease of using AT.

Comfortable Using a Computer * Assistive Technology is easy and Self-Taught use Crosstabulation

Count

		Assistive Technology is easy and Self-Taught use					Total
		NA	Strongly Disagree	Disagree	Agree	Strongly Agree	
Comfortable Using a Computer	NA	33	1	1	1	1	37
	Strongly Disagree	8	7	3	2	1	21
	Disagree	14	5	8	3	0	30
	Agree	52	29	39	22	4	146
	Strongly Agree	48	9	23	43	12	135
Total		155	51	74	71	18	369

Figure 8.13 Table of computing comfort level and ease of Assistive Technology

The significance of this finding was confirmed in Figure 8.13 in that there was very little relationship between the ease of using a computer and the ease of using AT. This further suggested that the difficulties faced by blind and vision

impaired people were not associated with the overall comfort level of using a computer, but more specifically due to the complexity of AT or the inability of AT to cater effectively for their needs.

In order to identify specifically the role of AT, the next comparison examined the relationship between requiring AT and ease of using AT.

Require Assistve Technology to use a Computer * Assistive Technology is easy and Self-Taught use Crosstabulation

Count

		Assistive Technology is easy and Self-Taught use					
		NA	Strongly Disagree	Disagree	Agree	Strongly Agree	Total
Require Assistve Technology to use a Computer	NA	55	6	3	4	2	70
	Strongly Disagree	21	4	3	4	0	32
	Disagree	29	1	7	8	0	45
	Agree	30	15	28	29	7	109
	Strongly Agree	20	25	33	26	9	113
Total		155	51	74	71	18	369

Figure 8.14 Table of requiring Assistive Technology and ease of Assistive Technology

As noted in Figure 8.14, access to AT was a significant barrier to successful use of computing when comparisons were viewed between the need for AT and the ease of using and learning AT products. Over 60% of those who need AT products disagreed or strongly disagreed that the products were easy to understand. The difference between the categories is heightened when examining the extreme views. Over 71% of those with a strong view disagreed that AT was easy to use. This again confirmed the data from the previous comparisons demonstrating that AT was not effective in meeting the needs of those that required it.

As previously discussed, another significant issue was that of web accessibility. The next comparative analysis examined the relationship between the comfort levels of using a computer and inaccessible web design.

Comfortable Using a Computer * Web Design makes the Internet Difficult Crosstabulation

Count

		Web Design makes the Internet Difficult					
		NA	Strongly Disagree	Disagree	Agree	Strongly Agree	Total
Comfortable Using a Computer	NA	33	1	1	0	2	37
	Strongly Disagree	10	2	7	1	1	21
	Disagree	10	4	3	8	5	30
	Agree	19	10	46	49	22	146
	Strongly Agree	15	8	42	49	21	135
Total		87	25	99	107	51	369

Figure 8.15 Table of computing comfort level and inaccessible web design

As noted in Figure 8.15, the perceived level of comfort remained relatively unchanged regardless of web accessibility issues. As with previous comparisons, this suggested a separation in the respondents' thinking between the ability to use and understand a computer and accessibility issues which may have prevented the use of a computer or the Internet.

Essentially, the key indicator of comfort level indicated that blind and vision impaired people perceived a clear separation between the level of comfort when using a computer and the difficulties faced when using computing and Internet-related technologies. This section demonstrated that, despite a consistent belief that the use of a computer is comfortable, significant accessibility issues remained in the use of AT, accessibility tools and web page accessibility. The data in this section would suggest that this was due to a combination of the level of complexity in the AT products, the ineffectiveness of AT products and the difficulties associated with inaccessible web design.

8.3.4 Effects of income and education on respondents

The identification of poverty and a lack of educational opportunities as factors in the disability divide have already been considered. This section explored the issues further, initially by examining the income levels and the cost of AT.

Income * Cost of Computer and Assistive Technology Prevents use Crosstabulation

Count

		Cost of Computer and Assistive Technology Prevents use					Total
		NA	Strongly Disagree	Disagree	Agree	Strongly Agree	
Income	<$15000	45	9	30	30	30	144
	$15,001-$25,000	18	6	20	12	13	69
	$25,001-435,000	24	3	14	8	3	52
	$35,001-$45,000	9	5	4	7	4	29
	$45,001-$60,000	14	5	10	2	3	34
	$60,000+	12	5	10	4	3	34
Total		122	33	88	63	56	362

Figure 8.16 Table of income levels and cost of Assistive Technology prevents use

As noted in Figure 8.16, the cost of AT on top of the cost of a computer were a factor which contributed to the disability divide. Over 60% of respondents with an income of less than $15,000 agreed or strongly agreed that this was a significant issue, yet for all other income levels a majority of respondents disagreed or strongly disagreed with this statement. The gap widened even further with respondents who had income levels over $45,000. This suggested that the people most disadvantaged in terms of income were least likely to be able to purchase equipment that could provide access to computing and Internet-related technologies.

The potential exclusion of people with disabilities from technology due to cost was examined through the comparison of income levels and the perception that disability prevented the use of the Internet.

Income * Disability Prevents the Use of the Internet Crosstabulation

Count

		Disability Prevents the Use of the Internet					Total
		NA	Strongly Disagree	Disagree	Agree	Strongly Agree	
Income	<$15000	33	15	24	45	27	144
	$15,001-$25,000	11	16	13	19	10	69
	$25,001-435,000	8	12	15	9	8	52
	$35,001-$45,000	4	2	10	8	5	29
	$45,001-$60,000	5	4	10	7	8	34
	$60,000+	5	10	8	10	1	34
Total		66	59	80	98	59	362

Figure 8.17 Table of income levels and disability prevents use of Internet

The identification of cost being a factor of the disability divide was examined further. Figure 8.17 showed that income levels were a factor in perceiving that

having a disability can prevent access to the Internet. There was a strong bias towards agreeing or strongly agreeing with the statement for those with income levels under $15,000 but relatively even opinions for other income levels. These comparisons demonstrated that people who were on incomes below $15,000 faced increased difficulties in gaining access to computers and perceived that their disability made it more difficult to access IT products and services. This finding is also supported by the survey open-ended comments whereby several respondents discussed the difficulties associated with low income in the prevention of purchasing necessary IT equipment.

In relation to education, a comparative analysis was conducted between current educational levels and attitude towards upgrading to new computing technologies.

Education - Current * Attitude Towards Computing Technologies Crosstabulation

Count

		Attitude Towards Computing Technologies				
		Latest Technology	Wait for Advice	Only when Necessary	Do Not Use	Total
Education - Current	Secondary	2	3	0	0	5
	TAFE Diploma	8	6	3	0	17
	University Undergrad	6	6	3	0	15
	University Postgrad	3	5	3	0	11
	Other	5	13	12	1	31
	Not Studying	47	70	104	61	282
Total		71	103	125	62	361

Figure 8.18 Table of current education and attitude towards upgrading

As noted in figure 8.18, a comparison between educational levels and attitude towards computing suggested again that the pursuit of education encouraged the use of computing. In every area of study, the number of respondents who upgraded to the latest technology or waited for advice is greater than those who only upgraded when necessary or did not use a computer at all. Such results were particular significant when compared with those who were not studying. In this group, the largest category of respondents were those who only upgraded when necessary and a high number of those did not use a computer. This suggested that undertaking studies highlighted the importance and benefits of computing and Internet-related technologies.

8.3.5 Disability-specific issues for respondents

One of the most important aims of the survey was to identify if people who were blind and vision impaired perceived that their disability affected their ability to interact with the Internet. The first comparative analysis examined the relationship between the perception that living with a disability would be more difficult without the Internet and the perception that having a disability prevented Internet use.

Disability would be more Difficult without Internet * Disability Prevents the Use of the Internet Crosstabulation

Count

		Disability Prevents the Use of the Internet					
		NA	Strongly Disagree	Disagree	Agree	Strongly Agree	Total
Disability would be more Difficult without Internet	NA	54	14	11	23	16	118
	Strongly Disagree	3	9	5	5	3	25
	Disagree	2	6	17	10	5	40
	Agree	3	14	24	33	12	86
	Strongly Agree	6	17	25	28	24	100
Total		68	60	82	99	60	369

Figure 8.19 Table of disability being more difficult without Internet and disability prevents use of Internet

As demonstrated in Figure 8.19 there was a notable link between the need for the Internet to help with disability-related issues and the difficulties in obtaining access to the Internet. The figures showed that regardless of the view regarding disability preventing access, there was clear agreement that a disability was more difficult without the Internet. Aside from the 'not applicable responses', the data clearly indicated that regardless of difficulties, there was still a perception that managing a disability was hard without access to the Internet. This verified earlier findings that it was not the perception of difficulties which prevented access, but real barriers as previously discussed.

Another factor examined was to verify if the type of vision stability affected the perception that life was more difficult without the Internet.

Disability would be more Difficult without Internet * Vision Stability Crosstabulation

Count

		Vision Stability		
		Degenerative	Stable	Total
Disability would be more Difficult without Internet	NA	81	37	118
	Strongly Disagree	14	11	25
	Disagree	18	22	40
	Agree	48	38	86
	Strongly Agree	54	46	100
Total		215	154	369

Figure 8.20 Table of disability being more difficult without Internet and vision stability

As noted in Figure 8.20, a comparison between disability-related difficulties without the Internet and vision stability revealed an increased number of ‘not applicable’ responses amongst respondents with degenerative conditions as opposed to respondents with stable conditions. However, the trend indicated by the previous comparison regarding vision stability remained, in that most respondents who did not answer ‘not applicable’ either agreed or strongly agreed.

The next comparison was to verify if the type of vision disability affected the perception that the Internet was more difficult due to having a disability.

Disability would be more Difficult without Internet * Description of Vision Crosstabulation

Count

		Description of Vision		
		No Vision	Vision Impairment	Total
Disability would be more Difficult without Internet	NA	12	106	118
	Strongly Disagree	1	24	25
	Disagree	5	35	40
	Agree	13	73	86
	Strongly Agree	22	77	99
Total		53	315	368

Figure 8.21 Table of disability being more difficult without Internet and vision level

As noted in Figure 8.21, there was a slight indication that blind people were even more convinced that their disability was more difficult than people who were vision impaired. A little over 53% of blind respondents strongly agreed with this statement as opposed to a little over 37% of vision impaired respondents. These two results combined suggested that having a stable vision condition or blindness required a heavier reliance on computing and Internet technologies.

The final comparison focused on the significance of real-time chat. As previously discussed, it was apparent that real-time chat services provided disability-specific benefits to those who had discovered the facility. To verify the significance of this, a comparative analysis was done between disability issues being more difficult without the Internet and the way in which Instant Messenger provided communication with others.

Disability would be more Difficult without Internet * Instant Messenger Software Useful for Communication Crosstabulation

Count

		Instant Messenger Software Useful for Communication					
		NA	Strongly Disagree	Disagree	Agree	Strongly Agree	Total
Disability would be more Difficult without Internet	NA	104	4	0	5	5	118
	Strongly Disagree	13	3	1	5	3	25
	Disagree	24	4	3	7	2	40
	Agree	49	4	5	14	14	86
	Strongly Agree	35	8	8	22	27	100
Total		225	23	17	53	51	369

Figure 8.31 Table of disability being more difficult without Internet and use of Instant Messenger

The results, as shown in figure 8.31, showed that most respondents who used Instant Messenger also agreed that disability issues were more difficult to manage without Internet access. This again reinforced the necessity of ensuring that blind and vision impaired Internet users were aware of the benefits that such communication tools could provide.

8.4 Conclusion

Overall, the analysis of the findings revealed many previously unknown elements of the disability divide in relation to blind and vision impaired people. The intra-section analysis revealed that the issues of poverty, unemployment, a lack of educational opportunities, difficulties with AT and difficulties with web page design were significant factors that required further exploration. The initial analysis also revealed that real-time communication provided vital disability-specific benefits to those who were aware of this Internet tool.

In order to extract the significance of these factors, a group analysis was performed to analyse in more detail how these factors contributed, or could potentially resolve, the disability divide. The first key factor clearly identified that people who were blind or vision impaired generally had a high level of IT expertise and that this issue was separate from the issues that prevented access to computing and the Internet. Put simply, people with vision disabilities could understand, use and were enthusiastic about computing and the Internet. However, the complexity and ineffectiveness of AT prevented that use. The second key indicator which focused on the comfort level of using a computer, again indicated that using a computer was a comfortable process but there were obstacles which mad it uncomfortable such as AT complexity and the inaccessibility of web sites. Again the respondents indicated a clear distinction between computer use and IT-related barriers.

The third key indicator was the relationship of income and education to the disability divide. This analysis revealed that, despite the difficulties of using AT, using a computer was necessary for most respondents and the cost of AT products prevented computer and Internet use. In relation to education, the undertaking of virtually any form of formal training resulted in the gaining of knowledge of computing and the Internet. Such knowledge also translated into a greater willingness to upgrade to new technologies.

The final key indicator related to the disability-specific perceptions of the disability divide. The respondents indicated that, despite the difficulties, the Internet provided significant benefits to people with disabilities. However, many people with disabilities were not aware of all the benefits that the Internet could provide, such as real-time communication.

In essence, the survey revealed that people who are blind or vision impaired did not perceive themselves as being unable to use computing and Internet-related technologies, but did have specific social and technological issues that needed to be addressed.

CONCLUSION

Addressing the research questions

The primary aim of this study was to discover the ways in which the digital divide for people with disabilities, or 'disability divide', can be bridged. Prior to this study, it was believed that people with vision disabilities were largely unaware of the benefits that such technologies could provide. It was therefore assumed that initial difficulties led to a rights-based decision to reject the benefits that computing and Internet-related technologies could provide. The survey data in this thesis has discovered that, in fact, people who are blind and vision impaired are highly aware of, and well informed in relation to the knowledge and use of information technology. Furthermore, people who are blind or vision impaired perceived that their disability would be more difficult to manage were it not for their ability to use the Internet. The bridging of the disability divide, therefore, was not facing difficulties due to a lack of willingness to participate, but rather reflected the need to resolve a complex interaction of social and technological barriers which included the perception of disability in society, the role of multinational corporations, the creation of government policy, the provision of online information and the needs of people who were blind or vision impaired.

The first research question for this study was to discover how people with vision disabilities perceive society and themselves, and how this affects the provision of computing and Internet-related technologies. In order to answer this question, it was first necessary to understand that the role of disability in society has changed significantly in recent decades. The charity-based dominant model viewed disability as a tragedy or a loss (Coloridge, 1993). Over time, this dominant model changed into the medical-based model which focused on people with disabilities as being inferior to able-bodied people (Price & Shildrick, 2002). The rights-based model, which promoted equality, gained dominance (Fulcher, 1989) and was shared with the economic model which promoted people with disabilities as consumers of products and services.

Furthermore, the views of society formed ideological stances which translated directly into policy and legislation (Drake, 1999). This, in turn, affected the views of society. The significance of these changes in relation to the disability divide was that the perception of disability is a fluid, ever-changing concept which has had a profound affect on the welfare of people with disabilities.

The perception of disability also changed depending on an individual's particular disability. This study also identified that people who were blind or vision impaired faced additional difficulties when compared with other disability groups. Blindness was often perceived as the most serious and fear-provoking disability, leading people with vision disabilities to be treated differently by the able-bodied population and even amongst other people with disabilities (Giridhar, Dandona, Prasad, Koval, & Dandona, 2002). Although this fear did not generally extend to the individual, there was a difficulty in society in acknowledging the needs of this disability group. This study has identified that issues of poverty, unemployment (Tacticall, 2002) and a lack of educational opportunities (Murray & Armstrong, 2004) were particularly severe amongst people who are blind or vision impaired.

The relationship between the different perceptions of disability by society and the disability divide came to light when examining the provision of computing and Internet-related technologies. The history of computing demonstrated that the disability divide was not a new concept but rather a cyclic, non-intentional denial of tools and resources that reoccurred with the acceptance of new technological advancements by the mainstream population. Historical examples include electronic travel aids, which although achieving their objective, were largely unsuccessful for people with vision disabilities due to a lack of consultation with the end users (Sardegna & Paul, 1991). Assistive technology products, although effective, took years to appear. This gap has been identified by this study as the initial disability divide. Although the gap gradually reduced in size over several years, it increased again with the arrival of new technologies such as the graphical user interface in the mid-1980s (Galitz, 2002). The evolution of the Internet highlighted disability divide parallels with the personal computer in that the text-based Internet became graphical with the introduction of the World Wide Web. This also prevented access to people

with vision disabilities until the assistive technology evolved to a point where it could provide limited accessibility (Goggin & Mewell, 2003).

The second research question asked if computing and Internet-related technologies are beneficial to people with vision disabilities. This study has revealed that historically, the use of technology to assist blind and vision impaired people has provided highly beneficial despite the disability divide. The development of the white cane, followed by the development of electronic travel aids, demonstrated the ways in which technology could be used to benefit this disability group. Although the developments were based on the medical model-based dominant category of restoring mobility to an inferior body, the more rights-based benefits to mobility and independence proved to be substantial. The introduction of the personal computer in the late 1970s continued this trend, providing significant benefits to both the mainstream population and people with disabilities. Whilst mainstream benefits to business and entertainment were profound, for people with vision disabilities, the arrival of the personal computer provided the ability to manipulate data into an accessible format through the adjustment of colours, size and output of text. The emergence of assistive technology, in the form of voice synthesizers, provided the conversion of text into an audio stream whilst the use of scanning technologies provided access to books which were previously inaccessible. Such benefits offered access to a wealth of information previously denied to this disability group. The Internet continued to provide benefits to people with vision disabilities in the form of independent access to online information. Additionally, the communication aspects of the Internet provided disability-specific support for people with vision disabilities.

The third research question asks if computing and Internet-related technologies are proving effective for people with disabilities. This question is addressed, in part, through the identification of the factors that contribute to the disability divide. This thesis has identified strong evidence that there is a digital divide amongst people with disabilities in Australia. Despite the current dominance of the rights-based and economic models, statistical data and government reports indicated that people with disabilities were not using computers or the Internet as much as the able-bodied population. Issues such as poverty and a lack of educational

opportunities confirm that people who are blind or vision impaired are more susceptible to this divide than many other disability groups.

The fourth research question asked in what way do government policies, online information providers and information technology corporations affect the people with vision disabilities. The methodology used to identify the cause and to offer potential solutions to the current disability divide, can be described in three parts. The first consisted of background research into these elements. The second was through personal interviews with the decision-makers in government and corporate bodies who had a significant impact on the means by which information technology was provided to people with vision disabilities. The third was to determine how the experience of blind and vision impaired people related to the disability divide which was achieved by a national survey of this disability group.

The creation of new policies was highly significant in shaping the thinking of society as it could reinforce an existing dominant social category and could legally determine how people with disabilities were to be treated. Such ideological stances included the charity-based negative policy which denied the civil rights of people with disabilities; the economic-based Laissez-faire policy which removed the state from the need to provide for people with disabilities; the piecemeal policy in which the state provided ad-hoc solutions for people with disabilities; the medical-based maximal policies in which state activity controlled the support of people with disabilities and rights-based equality policies. Clearly the perception of disability in society had a direct impact on the provision of tools and resources to people with disabilities.

An examination of the current legislative framework in Australia demonstrated that it consisted of the rights-based Federal legislation of the *Disability Services Act*, 1986, and the *Disability Discrimination Act*, 1992. These acts, in conjunction with similar state and territory-based legislation, ensured that people with disabilities were entitled to an effective delivery of services and protected against potential discrimination. Although Australia had no information technology-specific Federal legislation for people with disabilities, such policies have been implemented at a Federal level through the Commonwealth Disability Strategy. The

role of this policy, in terms of information technology, was to ensure that information not only distributed in accessible formats but that government purchased accessible services. However, the CDS was based largely on employment-related issues and it was left to the states and territories to focus on the implementation of accessible online information. Other legislation which has had an impact on the IT needs of people who are blind or vision impaired was the United States *Rehabilitation Act*, 1973, Section 508. Although not Australian legislation, most of the computing products used in Australia were, and still are, imported from the United States and as such this law had a significant impact. Unlike Australia, the legislation referred specifically to the IT needs of people with disabilities. Designed to compliment the United States *Americans with Disabilities Act*, 1990, Section 508 specified that products could not be sold to the US Federal government unless they met particular accessibility criteria.

Although such Australian and United States policies initially appeared to address any potential disability divide policy-related issues, closer inspection revealed that there were issues within current policy and legislation which were contributing to the disability divide. The issues surrounding current government policy and legislation emerged when examining the provision of government online information. Policies stated that all government web sites must comply with the World Wide Web Consortium web access initiative Single-A compliance standards. These standards were designed to ensure minimal accessibility and were particularly beneficial to people who were blind or vision impaired when using assistive technology to view sites. However, the interviewed government representatives uniformly acknowledged that a significant number of sites did not comply with this standard. Denial of inability to access government information online was a significant contribution to the disability divide. The reason for this was due largely to the confusion regarding responsibility for accessibility. The autonomous nature of government departments often resulted in a lack of awareness about the need for web accessibility. The fact that government web sites continued to provide information in an inaccessible format suggested that the policies in this area were ineffective and were contributing to the disability divide.

The United States Section 508 has demonstrated how a uniform approach to information technology needs of people with disabilities could be used to resolve these ambiguity issues. Such legislation has not only resolved the issue of who is responsible for accessibility but has also encouraged the development of accessible IT products and services. Many manufactures included accessibility features in their mainstream products as it was easier than making specific products for the US Federal government. However, there was some criticism of Section 508 in that non-government entities who provided public information, complied with the W3C Single-A standard. This issue was of particular interest to Australia given the landmark case of *Maguire v SOCOG* in 2000 where the ambiguity of the current policy and legislative frameworks resulted in Maguire winning the case. However, the web accessibility issue was not addressed.

The accessibility of web pages was the most well documented disability divide issue with much publicity over the need to ensure Single-A compliance. In order to examine the provision of online information, it was necessary to interview media organisations who specialised in the provision of online information. The British Broadcasting Corporation (BBC) emerged as being a specialist in ensuring that its online content met at least the W3C Single-A accessibility standards and in many cases Double-A accessibility standards. The BBC representative explained that in order for information to be made accessible, it was important that total integration of accessibility was used rather than creating an alternate text-only page as was the former policy. Such integration was important as text-only pages were often not included and thus did not provide the full features beneficial to people who were vision impaired but who would still like to participate in visual aspects of the web site.

The provision of online information in Australia was determined through comparing the BBC initiatives with those of the Australian Broadcasting Corporation (ABC). The ABC representatives indicated that they based much of their accessibility initiatives on the BBC model but that were unaware of the move away from the text-only alternative. As such, there were areas of the ABC site at the time of interview which had limited or inaccessible material. Although these issues have

been largely resolved in recent times, the information highlighted the need to ensure total integration of accessibility in order to prevent disability divide issues.

The accessibility of online information was also based on the way in which accessibility tools and assistive technologies interpreted such information. In relation to mainstream computing products there were three main types of operating environments: Microsoft Windows variants, Mac OS systems and UNIX-based systems. Windows systems represented a significant dominance of the market. For people who were blind or vision impaired, there were significant differences between the features of the Operating System. In Windows there were magnification and speech accessibility tools with limited functionality, whilst Mac OS, in recent releases, has implemented full screen magnification and text-to-speech software. UNIX-based operating systems had few accessibility tools in comparison.

In terms of assistive technology there were many products available. Hardware products included Braille and large print keyboards, Braille embossers, Braille displays, voice synthesizers, haptic mice and spatial feedback devices. Software products, designed primarily for Windows due to the limited functionality of its accessibility tools, included fully-featured screen magnification software and text-to-speech software. There were also software programs designed to test the accessibility of web pages.

In order to identify the interaction of these products in relation to the disability divide, it was necessary to examine the corporate policy on which such developments were based. Internally, there were significant policy differences between the corporations. The Microsoft representative indicated that the delivery of disability-specific products beyond basic tools should be left to those who were specialists in the area such as assistive technology providers. This perspective was reflected by the tools available in their OS. Apple representatives acknowledged that the company's focus in this area had shifted to a more inclusive environment, moving beyond the minimum requirements of Section 508 in order to provide an effective range of accessibility and development tools in the operating system. The Sun representative focused on the GNOME UNIX interface and the company's work in ensuring the accessibility of Java applets. The Cisco representative indicated that

the company had recently provided educational opportunities to blind and vision impaired people. The Hewlett-Packard representative stated that the company had focused on accessible hardware design and the IBM representatives reported that the company had developed a number of assistive technology products for blind and vision impaired users.

It became evident through the interviews, that the focus of these corporations differed. All representatives agreed that, due to the visual nature of computing, the difficulties faced by people with vision disabilities far outweighed that of many other disability groups. However, representatives of these companies confirmed that they perceived it was part of their role to provide that equality. Yet none of the corporations' policies indicated any recognition of the existence of the disability divide. The key that explained the difference between the perceived reality by the corporations' representatives and the daily lives of blind and vision impaired people clearly rested in the lack of direct consultation with blind and vision impaired people. When asked about how the companies found out about the needs of blind and vision impaired people, the answers included internal projects, meetings and conferences. At no point did any representative acknowledge direct contact with blind and vision impaired organisations or groups of blind and vision impaired people.

Clearly, the personal interviews demonstrate that the provision of information technology is not effective for people with disabilities due to a lack of awareness, In order to address the final research question and find potential resolutions to the disability divide, it was important that the voice of the people concerned had an opportunity to explain their perspective. Therefore, the best way to find this information was to explore the computing and Internet-related experiences directly from people who were blind or vision impaired. The survey results essentially joined the issues of society, technology, government and corporate bodies together and formed a complete disability divide picture. This also allowed for the formation of potential solutions.

Firstly, the data demonstrated that people with disabilities had a high level of computing and Internet expertise. The perceived reluctance in using computers and the Internet was due to specific barriers which were preventing access. People with

vision disabilities perceived the Internet to be a highly beneficial information and communication resource and there was an awareness that the Internet offers disability-specific benefits to the blind and vision impaired group.

The first significant barrier of the disability divide was the complexity and ineffectiveness of assistive technology and accessibility tools found in the operating system. People with vision disabilities have acknowledged that the provision of assistive technology and accessibility tools were vital in gaining access to a computer. However, as highlighted by the historical evolution of computing and the lack of consultation with this group by corporations, the available products were unable to provide adequately effective access to computing and the Internet. The findings of this study supported the view that the disability divide could be significantly improved if blind and vision impaired organisations were asked to work closely with corporations during the developmental process of emerging technologies. Such processes could have either ensured accessibility of emerging technologies, or provided usable assistive technology to enable accessibility for new products.

The second significant barrier of the disability divide was the relationship between government policy and the provision of online information. Given the difficulties in using assistive technology, it was imperative that web sites conformed to the web accessibility guidelines previously discussed. The survey has confirmed that in reality, the provision of online information by government and corporate entities is a haphazard affair, making the Internet an unreliable information resource. The findings of this study supported the view that government bodies should work towards resolving this issue thorough the creation of Federal-based information technology legislation for people with disabilities. Such legislation could ensure that any web site containing information deemed to be in the public interest must conform to specific accessibility criteria.

The third significant barrier of the disability divide was the existing difficulties faced by people who are blind and vision impaired in the form of poverty. As discussed throughout the thesis and verified by the survey results, people with vision disabilities were generally low income earners. As such, much needed

products and services, such as the assistive technology products, were simply too expensive for this group to purchase. This finding demonstrated the way in which the changing social categories played a part in shaping the welfare of people with disabilities. The desire for access to computing and the Internet by people with vision disabilities suggested that this group focused on a rights-based model whilst the large corporations perceived this group as a financial resource which presented a view based on the economic model. The findings of this thesis supported the view that the inclusion of such technologies with the purchase of a computer, or a reduction in the price, would have helped significantly in addressing this aspect of the disability divide.

The fourth significant barrier of the disability divide were the existing difficulties faced by people who are blind and vision impaired in relation to educational opportunities. The survey revealed that the reason why a lack of education contributed to the disability divide was the fact that the undertaking of some kind of formal education demonstrated a significantly improved access to computing and the Internet and hence a lack of education contributed to the disability divide. The type of education did not have to be specific to computers or the Internet as most subjects required the interaction of these technologies. The results of this thesis supported the view that improvements in educational opportunities in any area for blind and vision impaired people would help in addressing the disability divide.

The final significant aspect of the disability divide identified by this thesis was the need to improve the online experience for blind and vision impaired people through the use of real-time communication products. As previously discussed, one of the greatest benefits that the Internet can provide was the opportunity for people with similar disabilities to discuss disability-specific issues in online support groups. However, the survey revealed that, although most people in this group who used such products found the support vital to their interaction with disability issues, most blind and vision impaired people were not aware that such Internet tools existed beyond the use of e-mail and the World Wide Web. The findings of this thesis supported the view that the use of real-time communication should be encouraged by groups such as educators and blind and vision impaired organisations.

In essence, this study has revealed that people with vision disabilities perceive themselves as capable computing and Internet users. However, due to social and technological factors the numerous advantages of these technologies are being denied due to ineffective government and corporate support. Government policies based largely on the rights model have incorrectly assumed that people who are blind or vision impaired will pursue their own technological needs. Corporations, who base their policies on the economic model, have demonstrated a lack of awareness as to the needs of people with disabilities given the historically cycle ineffectiveness of new products and the high costs associated with assistive technology. In Australia, the Federal governments needs to take a more proactive approach until effective products and services are provided for people with vision disabilities. Furthermore, improved communication between government and corporate entities is required to guarantee that all parties work together to ensure that current future technological innovations include the needs of people with vision disabilities.

Within this framework, the voices of those affected have expressed the importance of computing and Internet-related technologies in two ways: to allow people with disabilities to participate in the same products and services as the able-bodied online community, and to provide disability-specific benefits. While some disability-specific benefits relate specifically to online tools such as real-time online support services, this thesis has demonstrated that there far reaching benefits in improving external issues such as new educational opportunities, poverty and unemployment.

As a person with both a personal and an academic interest in this area, it is my hope that these findings will contribute to the resolution of these issues so that future technological advancements will continue to improve the opportunities and independence of people who are blind or vision impaired.

Limitations of the study

Every effort was made in this research to ensure that the information gathered in this study was a reliable and valid reflection of those surveyed and interviewed.

However there were some limitations to the amount of information that could be gathered for this research.

In relation to the personal interviews, there were several people who could have offered information but were unavailable for interview. These consisted of the Federal Minister for Information Technology, the Minister for Family and Community Services and the Premier of Western Australia. Information was therefore obtained from senior policy advisors within the respective departments.

There were also limitations associated with the collection of survey data. The response rate to the survey was considered high enough to be a valid sample, but additional responses may have raised additional issues not discussed in this thesis. Another significant issue was the distribution process of the surveys. Firstly, there were difficulties in reaching every blind and vision impaired person due to the varying levels of cooperation within the blind and vision impaired organisations throughout Australia. This uneven distribution of surveys and the lack of opportunity for all to participate was considered when examining the validity of these data. Another important consideration was the issue of self-selection. Secondly, it was difficult to gauge the effectiveness of the multiple survey distribution formats. Thirdly, several organisations did not include cover sheets on the survey distribution which resulted in some respondents being unsure as to how their personal details were obtained and as a result specifically chose not to participate in the study.

Future directions

In essence, the current disability divide is a serious problem that is preventing people who are blind or vision impaired from accessing computers and the Internet. This restriction removes both mainstream and disability-specified benefits from this group. There are therefore a number of issues which, if researched and implemented, would assist in resolving the disability divide. They are:

- the creation of an effective communication system between developers and end users, resolving issues associated with ineffective and costly assistive technology

- the creation and implementation of Federal disability-specific information technology government policy
- research into new initiatives which could reduce poverty and improve employment opportunities for people who are blind or vision impaired
- research into initiatives which would improve educational opportunities for people who are blind or vision impaired and
- research and implement an educational program amongst blind and vision impaired organisations which demonstrates the disability-specific benefits of the Internet such as real-time online communication.

REFERENCES

Abledata. (2004a). Bach Braille Keyboard. Retrieved 25 October, 2004, from http://www.abledata.com/images/03A0067.jpg

Abledata. (2004b). Hooleon Large Print Keyboard. Retrieved 25 October, 2004, from http://www.abledata.com/images/02A1157.jpg

Abledata. (2004c). Vario 80 Refreshable Braille Display. Retrieved 25 October, 2004, from http://www.abledata.com/images/03A0883.jpg

Artic Technologies. (2004). Artic Transport Voice Synthesizer. Retrieved 27 October, 2004, from http://www.artictech.com/tport.htm

Australian Broadcasting Corporation. (2003, May). ABC Online Website Production Policy. 1.1. 2003

Australian Bureau of Statistics. (2003a, 15 September). Disability, Ageing and Carers. Retrieved 20 September, 2004, from http://www.abs.gov.au/Ausstats/abs@.nsf/0/C258C88A7AA5A87ECA2568A9001393E8?Open

Australian Bureau of Statistics. (2003b, 22 Sep 2004). Household Use of Information Technology, Australia. Retrieved 2 October, 2004, from http://www.abs.gov.au/Ausstats/abs@.nsf/0/acc2d18cc958bc7bca2568a9001393ae?OpenDocument

Australian Department of Community Services and Health. (1988). *TAFE and People with Disabilities First Report*. Canberra: Australian Government Publishing Services.

Australian Department of Human Services and Health. (2004). Commonwealth Disability Strategy: First Report. Retrieved 9 November, 2004, from http://www.facs.gov.au/disability/cds/cds/intro.htm

Australian Federal Government. (1986, 1 July 2004). Disability Services Act 1986. Retrieved 9 July 2004, 2004, from http://scaletext.law.gov.au/cgi-bin/download.pl?/scale/data/pasteact/0/188

Australian Federal Government. (1992, 1 July 2004). Disability Discrimination Act 1992. Act No. 135. Retrieved 9 July, 2004, from http://scaletext.law.gov.au/cgi-bin/download.pl?/scale/data/pasteact/0/311

Australian Federal Government. (2002). *Senate Committee into Poverty and Financial Hardship in Australia* (WWW). Canberra: Australian Federal Government.

Australian National Training Authority. (2005). Adaptive and Assistive Technologies in E-learning. Retrieved 30 November, 2005, from http://www.flexiblelearning.net.au/projects/resources/2005/adaptive_and_assistive_technologies_in_elearning_report.pdf

Australian Science and Technology Council. Technological Change Committee. (1984). *Technology and Handicapped People*. Canberra: Australian Government Publishing Service.

Balsamo, A. (1996). *Technologies of the Gendered Body*. London: Duke University Press.

Barrett, S., & LeDuc, G. (1998). Accessibility Features in Windows 98. Retrieved 1 November, 2004, from http://wata.org/pubs/articles/win98.htm

Barton, L. (1996). *Disability and Society*. New York: Longman.

Baume, P., & Kay, K. (1995). *Working Solution: Report of the Strategic Review of the Commonwealth Disability Services program*. Canberra: Australian Government Publishing Services.

Berners-Lee, T. (2002). What is Accessibility? Retrieved 18 July, 2002, from http://www.usablenet.com/accessibility_usability/accessibility.html

Bourk, M. (2000). *Telecommunications Policy in Australia and People with Disabilities*. Canberra: TOMW Communications.

Brabyn, J. (1994). *Orientation and Navigation Systems for the Blind: An Overview of Different Approaches*. San Francisco: Smith-Kettlewell Institute.

Bricout, J. C. (2001). Making Computer-mediated Education Responsive to the Accommodation Needs of Students with Disabilities. *Journal of Social Work Education, 37*(2), 267.

Bryant, D., & Bryant, B. (2003). *Assistive Technology for People with Disabilities*. Boston: Pearson Education.

Canadian Department of Human Resources and Skills Development. (1999). Lessons Learned from Evaluation of Disability Policy and Programs. Retrieved 20 November, 2005

Carlson, B., Burgess, A., & Miller, C. (1996). Timeline of Computing History. Retrieved 7 Aug, 2002, from http://www.computer.org/computer/timeline/

Carter, W. (2000, 2000). Bruce Maguire vs. Sydney Organising Committee for the Olympic Games (SOCOG). *Human Rights and Equal Opportunity Commission: Disability Discrimination Act 1992 No. H 99/115* Retrieved 20 December, 2001, from http://scaleplus.law.gov.au/html/ddadec/0/2000/0/DD000120.htm

Cavana, R. Y., & Delahaye, B. L. (2001). *Applied Business Research: Qualitative and Quantitative Methods*. Milton: Wiley & Sons Australia.

Clarke, R. (2001). A Brief History of the Internet in Australia Version 3.1. 2002, from http://www.anu.edu.au/people/Roger.Clarke/II/OzIHist.html

Clear, M. (2000). *Promises, Promises : Disability and Terms of Inclusion*. Leichhardt: Federation Press.

Coloridge, P. (1993). *Disability, Liberation and Development*. Oxford: Oxfam.

Coudroglou, A., & Poole, D. (1984). *Disability, work, and Social Policy : Models for Social Welfare*. New York: Springer.

Davies, A. C. (1984). The Home Computer Course Introduction. *The Home Computer Course, 1*, i-ii.

Davison, R. (2004, 15 July). IDC: Apple #5 in US Market with 3.7%. Retrieved 1 October, 2004, from http://www.insanelygreatmac.com/news.php?id=3571

Deutsch, H., & Nussbaum, F. (2000). *Defects Engendering the Modern Body*. Michigan: University of Michigan.

Digital Divide Network. (2002, 2002). Digital Divide Basics Fact Sheet. Retrieved 6 Aug, 2002, from http://digitaldividenetwork.org/content/stories/index.cfm?key=168

Dorman, S. (1998). Assistive Technology Benefits for Students with Disabilities. *Journal of School Health, 68*(3), 120-123.

Drake, R. (1999). *Understanding Disability Policies*. London: MacMillian.

European Agency for Safety and Health at Work. (2002). People with Disabilities. Retrieved 20 September, 2004, from http://europe.osha.eu.int/good_practice/person/disability/indexbytopic11.php?id=471

Foulke, E. (1971). The Perceptual Basis for Mobility. *AFB Resource Bulletin*(23), 1-8.

Fulcher, G. (1989). *Disabling Policies?: a Comparative Approach to Education Policy and Disability*. London: Falmer.

Galitz, W. (2002). *Essential Guide to User Interface Design*. New York: John Wiley & Sons.

Gerber, E., & Kirchner, C. (2001, 2001). Who's Surfing? Internet Access and Computer Use by Visually Impaired Youths and Adults. Retrieved 21 Oct, 2004, from http://www.afb.org/section.asp?Documentid=1521

Gergen, M. (1986). *Computer Technology for the Handicapped*. Minnesota: Crow River Press.

Gibson, W. (1984). *Neuromancer*. New York: Ace Books.

Giridhar, P., Dandona, R., Prasad, M., Koval, V., & Dandona, L. (2002). Fear of Blindness and Perceptions about Blind People: The Andhra Pradesh Eye Disease Study. Retrieved 10 March, 2005, from http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=12355705&dopt=Abstract

Goggin, G., & Mewell, C. (2003). *Digital Disability - The Social Construction of Disability In New Media*. New York: Rowman and Littlefield.

Harper, W., Kingsbury, J., & Hassell, J. (2002). Accessibility Study of BBCi: Problems Faced by Users with Disabilities. Retrieved 6 June, 2003

Hickman, L., & Longman, C. (1994). *Business Interviewing*. Berkshire: Addison-Wesley.

Hinn, M. (1999). Access Issues and Web Page Design. *Tech Trends, 43*(4), 19.

Hollier, S. (2004, 22-27 August). *Digital Disability An Examination into the Effectiveness of Multi-Modal Interfaces for People with Disabilities.* Paper presented at the IFIP 18th World Computer Congress, Toulouse, France.

Hollier, S., & Murray, I. (2004, 22-27 August). *The Evolution of E-Inclusion: Technology in Education for the Vision Impaired.* Paper presented at the IFIP 18th World Computer Congress, Toulouse, France.

Hood, J. (1996). Taking the Byte out of Disability. *Policy Review Washington*(76), 6.

Hoover, R. (1950). *The Cane as a Visual Aid.* New York: University Press.

Human Rights and Equal Opportunity Commission. (2002, August 2002). World Wide Web Access: Disability Descrimination Act Advisory Notes. Retrieved 20 October, 2004, from http://www.hreoc.gov.au/disability_rights/standards/www_3/www_3.html#s2_2

Humanware. (2004). BrailleNote. Retrieved 1 November, 2004, from http://www.pulsedata.com/products/Notetakers/BrailleNotePK.asp

Index Braille. (2004). Everest Braille Embosser. Retrieved 25 October, 2004, from http://www.indexbraille.com/products/basic-d.htm

Interface Consult. (2004). Defining Usability. Retrieved 12 October, 2004, from http://www.usability.at/e/usability/defining_usability.html

International Classification of Functioning Disability and Health. (2004). Introduction to the ICF. Retrieved 19 July, 2004, from http://www3.who.int/icf/icftemplate.cfm?myurl=introduction.html%20&mytitle=Introduction

Johnston, C. (2004). A Very Brief History of the Internet. Retrieved 2 October, 2004, from http://www.weav.bc.ca/weavnews/article.htm?123

Kanellos, M. (2004, 2 August). A Billion PC Users On The Way. Retrieved 1 October, 2004

King, T. W. (1999). *Assistive Technology Essential Human Factors*. Needham Heights: Allyn and Bacon.

Kostanjsek, N. (2004). *International Classification of Functioning, Disability and Health.* Paper presented at the 9th NACC Conference on ICF.

Kumar, V., Rahman, T., & Krovi, V. (2005). Assistive Technology for People with Motor Disabilities. Retrieved 4 August, 2005, from www.cim.mcgill.ca/~venkat/PUBLICATIONS/Wiley.pdf

Lane, T. (2000). ALP National Conference - Australia and the Region. Retrieved 2 January, 2006, from http://www.abc.net.au/rn/talks/natint/stories/s156944.htm

Lansdown, R. (1980). *More Than Sympathy*. London: Tavistock Publications.

Leiner, B. M., Cerf, V. G., Clark, D. D., Kahn, R. E., Kleinrock, L., Lynch, D. C., et al. (2002, 4 Mar 2002). A Brief History of the Internet. Retrieved 5 Aug, 2002, from http://www.isoc.org/internet/history/brief.shtml

Lemmetty, S. (2004). History and Development of Speech Synthesis. Retrieved 11 Feb, 2004, from http://www.acoustics.hut.fi/~slemmett/dippa/chap2.html

Lessard, D. (2004). PC Museum: History of Windows. Retrieved 11 Feb, 2004, from http://members.fortunecity.com/pcmuseum/windows.htm

Lindlif, T. R., & Shatzer, M. J. (1998). Media Ethnography in Virtual Space: Strategies, Limits, and Possibilities. *Journal of Broadcasting & Electronic Media, 42*(2), 170.

Lunt, N. (1994). Employment Policies for Disabled Pepole - a Review of Legislation. *Equal Opportunities International, 13*(6), 51.

Mace, R. (2004). What is Universal Design? Retrieved 12 October, 2004, from http://www.design.ncsu.edu:8120/cud/univ_design/ud.htm

Mayfield, K. (2001). Web News Still Fails Blind Users (Vol. 2004): WIRED.

McDaniel, J. W. (1969). *Physical Disability and Human Behavior*. New York: Pergamon.

Microsoft. (2002, 24 Jul 2002). History of Microsoft's Commitment to Accessibility. Retrieved 6 Aug, 2002, from http://www.microsoft.com/enable/microsoft/history.htm

Miniwatts International. (2004, 1 September). Internet Usage Statistics: The Big Picture. Retrieved 2 October, 2004, from http://www.internetworldstats.com/stats.htm

Mondak, P. (2000). The Americans with Disabilities Act and Information Technology Access. *Focus on Autism and Other Developmental Disabilities, 15*(1), 43.

Murray, I., & Armstrong, H. (2004, January 2004). *A Computing Education Vision for the Sight Impaired.* Paper presented at the ACE 2004, Computing Education 2004, Dunedin, New Zealand.

National Office of the Information Economy. (2002). *Advancing Australia: The Infomation Economy Report of 2002*. Canberra: NOIE.

National Telecommunications and Information Administration. (2000, Oct 2000). Falling Through the Net Towards Digital Inclusion. Retrieved 6 August, 2002, from http://www.ntia.doc.gov/ntiahome/fttn00/Falling.htm

Necasek, M. (2004). The History of OS/2. Retrieved 11 Feb, 2004, from http://pages.prodigy.net/michaln/history/timeline.html

Oliver, M. (1996). *Understanding disability from Theory to Practice*. London: Macmillan Press.

Parsons, I. (1994). *Oliver Twist has Asked for More*. Geelong: Villamanta.

Price, J., & Shildrick, M. (2002). Bodies Together - Touch, Ethics and Disability. In M. Corker & T. Shakespeare (Eds.), *Disability Post Modernity - Embodying Disability Theory*. London: Cromwell Press.

Reddy, S. (2004). Should computer scientists worry about ethics? Don Gotterbarn says yes. *Crossroads, 10*(3), 3-7.

Richards, J. (1982). *Towards Prevention of Permanent Disability in Australia*. Canberra: Australian Government Publishing Services.

Rooksby, E., Weckert, J., & Lucas, R. (2002). *Bridging the Digital Divide: A Study into Connectivity Issues for Disadvantaged People*. Canberra: ACT Government.

Royal National Institute of the Blind. (2003a). Microsoft Legal Actions Set to Continue. Retrieved December, 2003

Royal National Institute of the Blind. (2003b). No Alternative to Accessible Sites.

Royal National Institute of the Blind. (2004). US Disability Law Unravels Over Web. Retrieved October

Sainsbury, S. (1973). *Measuring Disability*. Birkenhead: Social Administration Research Trust.

San Diego State University. (2004). Distributed Learning. Retrieved 27 October, 2004, from http://www-rohan.sdsu.edu/~dl/fac_glossary.html

Sanford, G. (2004). AppleHistory.com. Retrieved 11 Feb, 2004, from http://www.apple-history.com/frames/?

Sapey, B. (2000). Disablement in the Informational Age. *Disability & Society, 15*(4), 619.

Sardegna, J., & Paul, T. (1991). *The Encyclopedia of Blindness and Vision Impairment*. New York: Facts on File, Inc.

Schlesinger, H., & Whelan, E. (1979). *Industry and Effort: A Study of Work Centres in England, Wales and Northern Ireland for Severely Disabled Adults*. London: Spastics Society.

SensAble Technologies. (2004). Omni Phantom. Retrieved 26 October, 2004, from http://www.sensable.com/images/products/Large%20PHANTOM%20Omni%20Image.jpg

Shakespeare, R. (1975). *The Psychology of Handicap*. London: Methuen.

Shrout, D. S. (1994). *Understanding and Accomodating Physical Disabilities*. Westport: Quorum books.

Stubbins, J. (1977). *Social and Psychological Aspects of Disability*. Baltimore: University Park Press.

Sutherland, A. (1981). *Disabled We Stand*. London: Souvenir Press.

Tacticall. (2002, 2002). Headset Design Opens Jobs to Blind People. Retrieved 30 November, 2004, from http://www.tacticall.com.au/visionlink_articles_page_2.htm

Taylor, H., Keeffe, J., & Mitchell, P. (2004). *Clear Insight - The Economic Impace and Cost of Vision Loss in Australia*: The Centre for Eye Research Australia.

Thomas, D. J. (1982). *The Experience of Handicap*. London: Methuen.

Trochim, W. D. K. (2002). Survey Research. Retrieved 30 Oct, 2003, from http://trochim.human.cornell.edu/kb/survey.htm

U.S. Department of Justice. (2002, 31 Jul 2002). Americans with Disabilities Act 1990. Retrieved 7 Aug, 2002, from http://www.usdoj.gov/crt/ada/adahom1.htm

U.S. General Services Administration - Center for IT Accommodation. (2003). *Opening Doors to IT*. Washington DC.

Ultrasonic Sound Information. (2005). Retrieved 20 February, 2005, from http://www.angelfire.com/nj3/soundweapon/ultrales.htm

United Nations Statistics Division. (2004). Human Functioning and Disability. Retrieved 20 September, 2004, from http://unstats.un.org/unsd/demographic/sconcerns/disability/

United States Census Bureau. (2000). Disability Status: 2000. Retrieved 20 July, 2004, from http://www.census.gov/hhes/www/disable/disabstat2k/table1.html

United States Department of Justice. (2002, 31 Jul 2002). Americans with Disabilities Act 1990. Retrieved 7 Aug, 2002, from http://www.usdoj.gov/crt/ada/adahom1.htm

United States Federal Government. (1998). Section 508: About 508. Retrieved 18 May, 2002, from http://159.142.162.122/index.cfm?FuseAction=Content&ID=3

United States General Services Administration. (2003). Section 508 Awareness - Promoting Awareness, Providing Solutions.

VirTouch Solutions. (2004). About the VTPlayer. Retrieved 26 October, 2004, from http://www.virtouch2.com/Features_and_Specs.htm

W3C. (1999, 5 May 1999). Web Content Accessibility Guidelines 1.0. Retrieved 18 July, 2002, from http://www.w3.org/TR/WCAG10/

Waddell, C. (2002). Is Your Site ADA-Compliant ... or a Lawsuit-in-Waiting? Retrieved 30 August, 2002, from http://www.icdri.org/is_%20yoursite_ada_compliant.htm

Walker, A. (2002, 2002). Accessibility to Technology. Retrieved 7 Aug, 2002, from http://www.viewz.com/featurearticles/viewzaccessibility.shtml

Webster, J. (1994). *Encyclopedia of Medical Devices and Instrumentation*. New York: John Wiley and Sons.

Williamson, K., Albrecht, A., Schauder, D., & Bow, A. (2001). Australian Perspectives on the Use of the Internet by People Who Are Visually Impaired and Professionals Who Work with Them. *Journal of Visual Impairment and Blindness*, *95*(11), 690.

Wilson, E. (2003). Impediment No Barrier. Retrieved 12 Feb, 2004, from http://www.smh.com.au/articles/2003/12/08/1070732143470.html

Wilson, J., & Wilson, C. (2001). *Embodied Rhetorics - Disability in Language and Culture*. Illionis: Southern Illinois University.

Winn, J. K. (2001). Electronic Commerce Law: 2001 Developments. *The Business Lawyer*, *57*(1), 541-586.

World Bank Group. (2004, 15 April). Disability Statistics. Retrieved 20 September, 2004, from http://web.worldbank.org/WBSITE/EXTERNAL/TOPICS/EXTSOCIALPROTECTION/EXTDISABILITY/0,,contentMDK:20192597~menuPK:417619~pagePK:148956~piPK:216618~theSitePK:282699,00.html

World Health Organization. (2004). Disability and Rehabilition. Retrieved 20 July, 2004, from http://www.who.int/ncd/disability/

World Wide Web Consortium. (1999, 5 May 1999). Checklist of Checkpoints for Web Content Accessibility Guidelines 1.0. Retrieved 18 July, 2002, from http://www.w3.org/TR/WCAG10/full-checklist.html

World Wide Web Consortium. (2002). W3C Web Accessibility Initiative. Retrieved 18 July, 2002, from http://www.w3.org/WAI/

World Wide Words. (1996, 5 May 2001). Turns of Phrase: Digital Divide. Retrieved 8 Aug, 2002, from http://www.worldwidewords.org/turnsofphrase/tp-dig1.htm

Zakon, R. (2002, 1 April). Hobbes' Internet Timeline v5.6. Retrieved 5 Aug, 2002, from http://www.zakon.org/robert/internet/timeline/

APPENDIX A: PERSONAL INTERVIEWS

A.1 Information sheet

TITLE OF STUDY:

"The Disability Divide: A Study Into The Impact Of Internet Technologies On People With Physical Disabilities"

AIMS OF STUDY:

1. To demonstrate the ways in which Internet technologies provide advantages for people with physical disabilities;
2. To develop a clear understanding of the ways in which people with physical disabilities perceive and utilise Internet technologies in relation to self, establishing the extent and nature of perceived barriers or benefits;
3. To investigate and determine the effectiveness of Internet-related products and services available to assist people with physical disabilities;
4. To determine the effect of government policy and corporate initiatives on the issues surrounding the disability divide; and
5. To propose solutions that will help close the disability divide in relation to Internet use and access between people with and without a disability.

PARTICIPANT INTERACTION:

1. Participants will be asked questions regarding their specific role and the role of the company or organization in relation to the use of Internet-related technologies for people with physical disabilities. These questions will range from specific issues of

products and services through to broader issues of social change and policies

2. Each interview will last approximately one hour.

ETHICS APPROVAL:

This Doctoral study conforms to the National Statement on Ethical Conduct in Research Involving Humans and has been approved by the Curtin University Human Research Ethics Committee..

CONFIDENTIALITY AND SECURITY:

- All interviews will require the consent of the interviewee;
- The interviewee will have the right to refuse an interview or reject a previously consented interview at any time up to the publication of the thesis;
- To ensure that any potential misunderstandings of the subject material are resolved prior to the interview taking place through clear and concise explanations of the source material;
- All interviewees will be kept completely confidential unless permission has been given by the interviewee; and
- All questions are designed in a way to eliminate bias.

RISKS:

Although some questions may be of a personal nature, there are no obvious safety issues that need to addressed during the interview process.

FURTHER INFORMATION:

Further information can be obtained through the following sources

- Scott Hollier PhD Student info@scotthollier.com

- Dr Matthew Allen Supervisor m.allen@curtin.edu.au
- Dr Michele Willson Supervisor m.willson@curtin.edu.au

A.2 Consent form

TITLE OF STUDY:

"The Disability Divide: A Study Into The Impact Of Internet Technologies On People With Physical Disabilities"

CONSENT:

In accordance with the National Statement on Ethical Conduct in Research Involving Humans, I confirm that:

1. I have been informed and I understand the purposes of the study;
2. I have been given the opportunity to ask questions;
3. I understand I can withdraw at any time without prejudice;
4. I agree to participate in the study as outlined to me;

IDENTITY AND CONFIDENTIALITY:

Please indicate your acceptance of one of the following three options:

OPTION 1: YES, I give permission for this interview to be recorded and any words spoken by me can be quoted and attributed to me in both doctoral dissertation and/or later publication.

OPTION 2: YES, I give permission for this interview to be recorded. Although I am happy for non-attributable generalisations to be drawn from this interview, any specific quotes or attributes will require additional

authorization in both doctoral dissertation and/or later publication.

OPTION 3: YES, I give permission for this interview to be recorded for the purposes of the researcher's later review and analysis but that nothing I say in this interview will be attributed to me or publicised in a manner that would imply attribution in both doctoral dissertation and/or later publication.

Name: _

Signature:

Date:

A.3 Government questions

Name:

Title:

Department:

Years in the role:

Years in government:

Responsibilities overview:

1. What do you perceive to be the main benefits of the Internet when used by the general public? What do you perceive to be the main detriments?

2. How can people with physical disabilities benefit from the existing products and services on the Internet? Do you perceive there to be any specific advantages in relation to mobility difficulties? (eg using Internet chat to talk to people if physically visiting is too difficult)

3. How do you perceive the government's contribution to the access and use of Internet technologies for people with physical disabilities?

4. How has your role within the government led to changes in relation to Internet access and use by people with physical disabilities?

5. Is it your view that people with physical disabilities require specialist products and services to access Internet-related technologies?

6. Do you perceive that people with physical disabilities are able to access the same products and services online as able-bodied individuals?

7. Are you aware of specific operating system, application and third-party products and services used to assist people with physical disabilities?

8. Do you perceive that people with physical disabilities are well informed about the benefits of Internet-related technologies? Do you feel they are well-informed about specific tools and services that could help them access the Internet?

9. What would you say are the most significant factors preventing people with physical disabilities accessing Internet-related technologies?

10. Which disability groups do you perceive to have the most difficulty in accessing Internet-related technologies? (eg people who are blind or vision impaired, people with mobility issues)

11. Do you perceive there to be an issue of technological reluctance amongst people with physical disabilities in Australia?

12. Is existing legislation, such as the Disability Services Act of 1985 and the Disability Discrimination Act of 1992, sufficient to ensure that people with physical disabilities are not disadvantaged in relation to the access of Internet-related technologies? In relation to the use of online products and services?

13. In the United States, the Rehabilitation Act of 1973 features a specific section, titled Section 508 referring to the technological needs of people with disabilities within their Federal government. Does the introduction of breakthrough overseas policies such as this affect the way in which Australian legislation is formed?

14. In the United States, specific Information Technology polices are created, implemented and centralized to the Federal government. In Australia, accessibility policies are decentralized to the respective states. Which system do you feel best serves the needs of people with disabilities? why?

15. How does the government gather information regarding the needs of people with disabilities in relation to the use of Information Technology resources?

16. What are the connections between corporations, government and lobby groups when it comes to creating accessible products and services? Can you provide examples from your own experiences? Do you feel that this type of interaction affects the way in which corporations and government policy act and interact in Australia?

17. In your opinion, are educational institutions doing enough to teach students in courses, such as Computer Science, Engineering and Internet Studies, about disability issues within the Information Technology environment?

18. Do you perceive that private corporations are doing enough to create products and services for people with physical disabilities?

19. What do you perceive to be the major differences in accessibility policy between the Australian government and other governments in relation to the use of technology by people with physical disabilities?

20. What do you perceive to be the major differences in accessibility policy between the current government and the opposition?

A.4 Corporate questions

Name:

Title:

Department:

Organisation:

Years in the role:

Years in organization:

Responsibilities overview:

1. What do you perceive to be the main benefits of the Internet when used by the general public? What do you perceive to be the main detriments?

2. How can people with physical disabilities benefit from the existing products and services on the Internet? Do you perceive there to be any specific advantages in relation to mobility difficulties? (eg using Internet chat to talk to people if physically visiting is too difficult)

3. How do you perceive your organization has contributed to the access and use of Internet technologies for people with physical disabilities?

4. How has your role within your organization led to changes in relation to Internet access and use by people with physical disabilities?

5. Is it your view that people with physical disabilities require specialist products and services to access Internet-related technologies?

6. Do you perceive that people with physical disabilities are able to access the same products and services online as able-bodied individuals?

7. Are you aware of specific operating system, application and third-party products and services used to assist people with physical disabilities?

8. Do you perceive that people with physical disabilities are well informed about the benefits of Internet-related technologies? Do you feel they are well-informed about specific tools and services that could help them access the Internet?

9. What would you say are the most significant factors preventing people with physical disabilities accessing Internet-related technologies?

10. Which disability groups do you perceive to have the most difficulty in accessing Internet-related technologies? (eg people who are blind or vision impaired, people with mobility issues)

11. Do you perceive there to be an issue of technological reluctance amongst people with physical disabilities in this country? In other countries? In Australia?

12. Is existing legislation, such as the Rehabilitation Act of 1973 and the Disability Americans with Disabilities Act 1990, sufficient to ensure that people with physical disabilities are not disadvantaged in relation to the access of Internet-related technologies? In relation to the use of online products and services?

13. In this country, the Rehabilitation Act of 1973 features a specific section, titled Section 508 referring to the technological needs of people with disabilities within the Federal government. Did the introduction of Section 508 affect the way in which your organisation's accessibility policies were formed? Do you have any views regarding this type of legislation should be introduced into other countries such as Australia?

14. In the United States, specific Information Technology polices are created, implemented and centralized to the Federal government. In Australia, accessibility policies are decentralized to the respective states. Do you believe that the differences in Information Technology policy would affect

the way in which your organisation provides accessible products and services?

15. How does your organisation gather information regarding the needs of people with disabilities in relation to the use of Information Technology resources?

16. What are the connections between corporations, government and lobby groups when it comes to creating accessible products and services? Can you provide examples from your organisation's own experiences? Do you feel that this type of interaction affects the way in which corporations and government policy act and interact in other countries, such as Australia?

17. In your opinion, are educational institutions doing enough to teach students in courses, such as Computer Science, Engineering and Internet Studies, about disability issues within the Information Technology environment?

18. Do you perceive that private corporations are doing enough to create products and services for people with physical disabilities?

19. What do you perceive to be the major differences in accessibility development between your organisation and other organisations in relation to the use of technology by people with physical disabilities?

20. Developing accessible products and services can have many beneficial side-effects. As well as being seen as a good corporate citizen by adhering to the legal requirements, there is also positive publicity. The tradeoff is the high development costs for a limited number of clients. Do you consider all the corporate advantages and disadvantages before developing such products and services?

A.5 Media questions

Name:

Title:

Department:

Organisation:

Years in the role:

Years in organisation:

Responsibilities overview:

1. What do you perceive to be the main benefits of the Internet when used by the general public to access news and media services?

2. What do you perceive to be the main detriments of the Internet when used by the general public to access news and media services?

3. How can people with physical disabilities benefit from accessing news and media services on the Internet?

4. How do you perceive your organisation has contributed to the access and use of Internet technologies for people with physical disabilities?

5. How has your specific role within your organisation led to changes in relation to Internet access and use by people with physical disabilities?

6. Is it your view that people with physical disabilities require specialist products and services to access Internet-related technologies?

7. Are you aware of specific products and services used to assist people with physical disabilities?

8. Do you perceive that people with physical disabilities are well informed about the benefits of accessing Internet news and media resources?

9. Is it your belief that people with physical disabilities are aware of the products and services which could assist them in accessing Internet news and media resources?

10. What would you say are the most significant factors preventing people with physical disabilities accessing Internet news and media services?

11. Which disability groups do you perceive to have the most difficulty in accessing Internet news and media services?

12. Do you perceive the issue of technological reluctance by people with physical disabilities to be approaching a crisis point in Australia?

13. Is existing legislation, such as the Disability Services Act of 1985 and the Disability Discrimination Act of 1992, provides enough guidance in the creation of accessible Internet news and media resources?

14. In the United States, the Rehabilitation Act of 1972 features a specific section, titled Section 508 referring to the technological needs of people with disabilities with their Federal government. Do you have nay views regarding this type of legislation being introduced in Australia?

15. How does your organisation gather information regarding the needs of people with disabilities in relation to the use of Internet news and media resources?

16. Are the accessibility requirements of your organization for Internet news and media services influenced by multinational corporations and the governments of other countries? (For example, Microsoft visits)

17. The primary responsibility for access and equity for people with disabilities in relation to Information Technology lies with the respective state governments. The Federal government also assists through coordination of the States and input into equity policy. Do you have any views on this structure in relation to achieving the maximum benefits for people with physical disabilities for your organisation?

18. In your opinion, are educational institutions doing enough to teach students in courses, such as Computer Science, Engineering and Internet Studies, about disability issues within the Information Technology environment for Internet news and media resources?

19. Do you perceive that private corporations are doing enough to create products and services for people with physical disabilities?

20. What do you perceive to be the major differences between your organization and other organizations in relation to the development of accessible Internet news and media resources to assist people with physical disabilities?

APPENDIX B: SURVEY

B.1 Information sheet

TITLE OF STUDY:

"The Disability Divide: A Study Into The Impact Of Internet Technologies On People With Physical Disabilities"

AIMS OF STUDY:

1. To demonstrate the ways in which Internet technologies provide advantages for people with physical disabilities;
2. To develop a clear understanding of the ways in which people with physical disabilities perceive and utilise Internet technologies in relation to self, establishing the extent and nature of perceived barriers or benefits;
3. To investigate and determine the effectiveness of Internet-related products and services available to assist people with physical disabilities;
4. To determine the effect of government policy and corporate initiatives on the issues surrounding the disability divide; and
5. To propose solutions that will help close the disability divide in relation to Internet use and access between people with and without a disability.

PARTICIPANT INTERACTION:

1. Participants will be asked to provide answers to questions based on general knowledge of Computing and Internet technology concepts, knowledge of specific Internet connectivity, views on the provision of resources by government and corporate entities and the opportunity for further comment.
2. This survey has been distributed to Australians aged 18 and over. The survey should be completed only if you meet this criteria.
3. The survey instrument is provided in four different formats: large print, Braille, online and via a telephone interview. A large copy or Braille edition should be attached to with this information sheet. If the participant would prefer to complete the survey via an alternative format, the online edition can

be found at http://www.vipsurvey.org . and telephone bookings can be made on (08) 9266 2583.

ETHICS APPROVAL:

This Doctoral study conforms to the National Statement on Ethical Conduct in Research Involving Humans and has been approved by the Curtin University Human Research Ethics Committee.

CONFIDENTIALITY AND SECURITY:

1. All completed surveys will require the consent of the participant;
2. The participant will have the right to withdraw their contribution at any time up to the publication of the thesis;
3. To ensure that any potential misunderstandings of the subject material are resolved prior to the interview taking place, the participant will be required to acknowledge this information sheet and complete the consent form before proceeding;
4. All participant identities will be kept completely confidential; and
5. All questions are designed in a way to eliminate bias.

RISKS:

Although some questions may be of a personal nature, there are no obvious safety issues that need to addressed during the participation in this survey.

FURTHER INFORMATION:

Further information can be obtained through the following sources

- Scott Hollier, PhD Student, info@scotthollier.com
- Dr Matthew Allen, Supervisor, m.allen@curtin.edu.au
- Dr Michele Willson, Supervisor, m.willson@curtin.edu.au

B.2 Consent form

CONSENT:

In accordance with the National Statement on Ethical Conduct in Research Involving Humans, I confirm that:

1. I have been informed and I understand the purposes of the study;
2. I understand that I am able to ask questions;
3. I understand I can withdraw at any time without prejudice;
4. I agree to participate in the study as outlined to me;
5. I understand that my identity will be kept strictly confidential.

Name:

Signature:

Date:

B.3 Survey questions

Thank you for taking the time to participate in this survey. Please post your completed survey and consent form using the provided reply-paid envelope. .

Section A: Personal Information

1. Age: _____

2. Postcode: _____

Please choose one option from the following questions:

3. Gender:

[ ] 1 Male

[ ] 2 Female

4. My living arrangements are best described as:

[ ] 1 Living with parent(s)

[ ] 2 Living in shared accommodation

[ ] 3 Living with a partner

[ ] 4 Living alone

5. My employment status is:

[ ] 1 Full-time

[ ] 2 Part-time

[ ] 3 Casual

[ ] 4 Unemployed/Retired

6. My income per annum from all sources is:

[ ] 1 Less than $15,000

[ ] 2 $15,000-$25,000

[ ] 3 $25,001-$35,000

[ ] 4 $35,001-$45,000

[ ] 5 $45,001-$60,000

[ ] 6 Over $60,000

7. The stability of my vision can be described as:

[ ] 1 Degenerative

[ ] 2 Stable

Please mark all the boxes that best match your circumstance:

8. My vision can be described as:

[ ] 1 No vision

[ ] 2 Peripheral vision impairment

[ ] 3 Central vision impairment

[ ] 4 Night vision impairment

[ ] 5 Distance vision impairment

[ ] 6 Near vision impairment

9. I have completed the following:

[ ] 1 Secondary education to Year 10
[ ] 2 Secondary education to Year 12
[ ] 3 TAFE diploma or advanced diploma
[ ] 4 University undergraduate course
[ ] 5 University postgraduate course
[ ] 6 Other: Please specify _____

Please choose one option from the following questions:

10. I am currently completing the following:

[ ] 1 Secondary education
[ ] 2 TAFE diploma or advanced diploma
[ ] 3 University undergraduate course
[ ] 4 University postgraduate course
[ ] 5 Other: Please specify _____
[ ] 6 I am not studying at this time

Section B: Computing and Assistive Technology knowledge

Please mark all that apply

11. I am familiar with the following personal computing products:

[ ] 1 Microsoft Windows
[ ] 2 Macintosh Operating System (Mac OS)
[ ] 3 UNIX-based operating systems
[ ] 4 Hardware devices such as keyboard and mouse

12. I am familiar with the following assistive technology products:

[ ] 1 Screen magnification software such as ZoomText

[ ] 2 Text-to-speech software such as JAWS

[ ] 3 Portable devices such as the BrailleNote and PACMate

Using the scale:

1–none, 2–poor, 3–fair, 4–good, 5–expert

Please provide a response to the following statements:

13. My overall knowledge of personal computing can be best described as: _____

14. My overall knowledge of assistive technology products can be best described as: _____

15. My ability to use a personal computer can be best described as: _____

16. My ability to use assistive technology products can be best described as: _____

Please select the statement which **best** describes your computing

17. My attitude towards embracing computing technologies can be best described as:

[ ] 1 I am constantly using the latest computing technologies

[ ] 2 I generally seek advice or see how the market responds before embracing new computing technology

[ ] 3 I only embrace new computing technology when it is absolutely necessary

[ ] 4 I do not use computing technology at all

Using the scale:

1–not applicable, 2–strongly disagree, 3–disagree, 4–agree,

5–strongly agree

Please provide a response to the following statements:

18. I am comfortable with the overall experience of using a computer: _____

19. I need assistive technology to use a computer: _____

20. I find that changing the colour scheme on my computer display helps me to use a computer: _____

21. I find the accessibility features built into the operating system helps me to use a computer: _____

Section C: Internet knowledge

Please mark all that apply:

22. I am familiar with the following Internet products:

[ ] 1 Web browser (for viewing web pages)
[ ] 2 E-mail (for sending and receiving messages)
[ ] 3 Newsgroups and mailing lists (for group discussion)
[ ] 4 Chat programs (such as MSN Messenger, IRC and ICQ)
[ ] 5 Peer-to-peer file swapping software (for exchanging music and other media files)

Using the scale:

1–none, 2–poor, 3–fair, 4–good, 5–expert

Please provide a response to the following statements:

23. My understanding of the Internet can be best described as: _____

24. My ability to use the Internet can be best described as: _____

Using the scale:
1–not applicable, 2–strongly disagree, 3–disagree, 4–agree,
5–strongly agree
Please provide a response to the following statements:

25. It is easy to find the information I'm looking for on the Internet: _____

26. The way in which web pages are designed prevents me from easily accessing the information I need: _____

27. The accessibility tools built into my computer's operating system help me to use the Internet: _____

28. My disability prevents me from fully utilising the Internet: _____

29. The assistive technology software I use to access web sites has trouble understanding the information found on web pages: _____

30. I believe that sending e-mail is a simple form of communication: _____

31. I often receive e-mails which that my speech software cannot process: _____

32. Instant messenger software helps me keep in touch with family and friends: _____

33. Internet users treat me differently when they discover I have a disability: _____

34. I find that communicating with Internet users that share my disability provide me with support: _____

35. Internet users who do not have a disability have a good understanding as to how I use the Internet: _____

36. My life would be more difficult due to my disability if I could not use the Internet: _____

37. I do not use the Internet because I get nothing from it: ____

Section D: Government and Corporate views

38. I believe the government has done a good job in making its web sites and associated technologies accessible to people with disabilities: _____

39. I prefer to find news and media-related information through the Internet than other mediums: _____

40. I am able to locate news and similar web sites easily but find it difficult to locate specific articles within those web sites: _____

41. I believe that the makers of computing operating systems have a good understanding of what people with disabilities need in order to access computers: _____

42. The design of the computer itself (box, keyboard, mouse etc) could be improved to help me use the computer more effectively: _____

43. The cost of purchasing assistive technology, on top of the cost of a new computer, is preventing me from using a computer: _____

44. I would find using the Internet too difficult if I did not have people to assist me: _____

45. Learning how to use assistive technology is a simple

process which I mastered by myself: _____

Section E: Comments

If you have any thoughts or suggestions on how home computing, the Internet or how assistive technologies could be improved, please provide your comments here.

APPENDIX C: THE WORLD WIDE WEB CONSORTIUM (W3C) ACCESSIBILITY GUIDELINES 1.0

These guidelines have been obtained from the W3C (World Wide Web Consortium, 1999) and are as follows:

Priority 1:
A Web content developer must satisfy this checkpoint. Otherwise, one or more groups will find it impossible to access information in the document.
Priority 2:
A Web content developer should satisfy this checkpoint. Otherwise, one or more groups will find it difficult to access information in the document.
Priority 3:
A Web content developer may address this checkpoint. Otherwise, one or more groups will find it somewhat difficult to access information in the document.

Priority 1:
In General (Priority 1)

- 1.1 Provide a text equivalent for every non-text element (e.g., via "alt", "longdesc", or in element content). This includes: images, graphical representations of text (including symbols), image map regions, animations (e.g., animated GIFs), applets and programmatic objects, ascii art, frames, scripts, images used as list bullets, spacers, graphical buttons, sounds (played with or without user interaction), stand-alone audio files, audio tracks of video, and video.
- 2.1 Ensure that all information conveyed with color is also available without color, for example from context or markup.
- 4.1 Clearly identify changes in the natural language of a document's text and any text equivalents (e.g., captions).
- 6.1 Organize documents so they may be read without style sheets. For example, when an HTML document is rendered without associated style sheets, it must still be possible to read the document.
- 6.2 Ensure that equivalents for dynamic content are updated when the dynamic content changes.
- 7.1 Until user agents allow users to control flickering, avoid causing the screen to flicker.
- 14.1 Use the clearest and simplest language appropriate for a site's content.

And if you use images and image maps (Priority 1)

- 1.2 Provide redundant text links for each active region of a server-side image map.
- 9.1 Provide client-side image maps instead of server-side image maps except where the regions cannot be defined with an available geometric shape.

And if you use tables (Priority 1)

- 5.1 For data tables, identify row and column headers.

- 5.2 For data tables that have two or more logical levels of row or column headers, use markup to associate data cells and header cells.

And if you use frames (Priority 1)

- 12.1 Title each frame to facilitate frame identification and navigation.

And if you use applets and scripts (Priority 1)

- 6.3 Ensure that pages are Usable when scripts, applets, or other programmatic objects are turned off or not supported. If this is not possible, provide equivalent information on an alternative accessible page.

And if you use multimedia (Priority 1)

- 1.3 Until user agents can automatically read aloud the text equivalent of a visual track, provide an auditory description of the important information of the visual track of a multimedia presentation.
- 1.4 For any time-based multimedia presentation (e.g., a movie or animation), synchronize equivalent alternatives (e.g., captions or auditory descriptions of the visual track) with the presentation.

And if all else fails (Priority 1)

- 11.4 If, after best efforts, you cannot create an accessible page, provide a link to an alternative page that uses W3C technologies, is accessible, has equivalent information (or functionality), and is updated as often as the inaccessible (original) page.

Priority 2:

In General (Priority 2)

- 2.2 Ensure that foreground and background color combinations provide sufficient contrast when viewed by someone having color deficits or when viewed on a black and white screen. [Priority 2 for images, Priority 3 for text].
- 3.1 When an appropriate markup language exists, use markup rather than images to convey information.
- 3.2 Create documents that validate to published formal grammars.
- 3.3 Use style sheets to control layout and presentation.
- 3.4 Use relative rather than absolute units in markup language attribute values and style sheet property values.
- 3.5 Use header elements to convey document structure and use them according to specification.
- 3.6 Mark up lists and list items properly.
- 3.7 Mark up quotations. Do not use quotation markup for formatting effects such as indentation.
- 6.5 Ensure that dynamic content is accessible or provide an alternative presentation or page.
- 7.2 Until user agents allow users to control blinking, avoid causing content to blink (i.e., change presentation at a regular rate, such as turning on and off).
- 7.4 Until user agents provide the ability to stop the refresh, do not create periodically auto-refreshing pages.
- 7.5 Until user agents provide the ability to stop auto-redirect, do not use markup to redirect pages automatically. Instead, configure the server to perform redirects.

- 10.1 Until user agents allow users to turn off spawned windows, do not cause pop-ups or other windows to appear and do not change the current window without informing the user.
- 11.1 Use W3C technologies when they are available and appropriate for a task and use the latest versions when supported.
- 11.2 Avoid deprecated features of W3C technologies.
- 12.3 Divide large blocks of information into more manageable groups where natural and appropriate.
- 13.1 Clearly identify the target of each link.
- 13.2 Provide metadata to add semantic information to pages and sites.
- 13.3 Provide information about the general layout of a site (e.g., a site map or table of contents).
- 13.4 Use navigation mechanisms in a consistent manner.

And if you use tables (Priority 2)

- 5.3 Do not use tables for layout unless the table makes sense when linearized. Otherwise, if the table does not make sense, provide an alternative equivalent (which may be a linearized version).
- 5.4 If a table is used for layout, do not use any structural markup for the purpose of visual formatting.

And if you use frames (Priority 2)

- 12.2 Describe the purpose of frames and how frames relate to each other if it is not obvious by frame titles alone.

And if you use forms (Priority 2)

- 10.2 Until user agents support explicit associations between labels and form controls, for all form controls with implicitly associated labels, ensure that the label is properly positioned.
- 12.4 Associate labels explicitly with their controls.

And if you use applets and scripts (Priority 2)

- 6.4 For scripts and applets, ensure that event handlers are input device-independent.
- 7.3 Until user agents allow users to freeze moving content, avoid movement in pages.
- 8.1 Make programmatic elements such as scripts and applets directly accessible or compatible with assistive technologies [Priority 1 if functionality is important and not presented elsewhere, otherwise Priority 2.]
- 9.2 Ensure that any element that has its own interface can be operated in a device-independent manner.
- 9.3 For scripts, specify logical event handlers rather than device-dependent event handlers.

Priority 3:

In General (Priority 3)

- 4.2 Specify the expansion of each abbreviation or acronym in a document where it first occurs.
- 4.3 Identify the primary natural language of a document.
- 9.4 Create a logical tab order through links, form controls, and objects.
- 9.5 Provide keyboard shortcuts to important links (including those in client-side image maps), form controls, and groups of form controls.

- 10.5 Until user agents (including assistive technologies) render adjacent links distinctly, include non-link, printable characters (surrounded by spaces) between adjacent links.
- 11.3 Provide information so that users may receive documents according to their preferences (e.g., language, content type, etc.)
- 13.5 Provide navigation bars to highlight and give access to the navigation mechanism.
- 13.6 Group related links, identify the group (for user agents), and, until user agents do so, provide a way to bypass the group.
- 13.7 If search functions are provided, enable different types of searches for different skill levels and preferences.
- 13.8 Place distinguishing information at the beginning of headings, paragraphs, lists, etc.
- 13.9 Provide information about document collections (i.e., documents comprising multiple pages.).
- 13.10 Provide a means to skip over multi-line ASCII art.
- 14.2 Supplement text with graphic or auditory presentations where they will facilitate comprehension of the page.
- 14.3 Create a style of presentation that is consistent across pages.

And if you use images and image maps (Priority 3)

- 1.5 Until user agents render text equivalents for client-side image map links, provide redundant text links for each active region of a client-side image map.

And if you use tables (Priority 3)

- 5.5 Provide summaries for tables.
- 5.6 Provide abbreviations for header labels.
- 10.3 Until user agents (including assistive technologies) render side-by-side text correctly, provide a linear text alternative (on the current page or some other) for all tables that lay out text in parallel, word-wrapped columns.

And if you use forms (Priority 3) Yes No N/A

- 10.4 Until user agents handle empty controls correctly, include default, place-holding characters in edit boxes and text areas.

APPENDIX D: LIST OF ACRONYMNS USED IN THIS THESIS

AARnet	Academic and Research Network
ABC	Australian Broadcasting Corporation
ABS	Australian Bureau of Statistics
ABWA	The Association for the Blind of Western Australia
ACSnet	Australian Computer Science Network
ACT	Australian Capital Territory
ADA	Americans with Disabilities Act of 1990
ALP	Australian Labor Party
API	Application Programming Interface
ARPA	Advanced Research Projects Agency
AT	Assistive Technology
ATM	Automatic Teller Machine
BBC	British Broadcasting Corporation
BCA	Blind Citizens Australia
CAVI	Cisco Academy for the Vision Impaired
CCNA	Cisco Certified Network Administrator
CCTV	Closed Circuit Television
CDS	Commonwealth Disability Strategy
CLI	Command Line Interface
CSS	Cascading Style Sheets
DCS	Department of Community Services
DDA	Disability Discrimination Act of 1992
DSA	Disability Services Act of 1986
EU	European Union
ETA	Electronic Travel Aid
GPS	Global Positioning System
GSA	Government Services Administration
GUI	Graphical User Interface
HP	Hewlett-Packard
HREOC	Human Rights and Equal Opportunities Commission
HTML	Hyper Text Markup Language
IBM	International Business Machines

IDC	International Data Corporation
ISP	Internet Service Provider
IT	Information Technology
IP	Internet Protocol
ICIDH	International Classification of Impairment, Disability and Handicap
ICF	International Classification of Functioning, Disability and Health
Mac OS	Macintosh Operating System
MP	Member of Parliament
NOIE	National Office of the Information Economy
NSW	New South Wales
OCR	Optical Character Recognition
PC	Personal Computer
PDA	Personal Digital Assistant
RA	Rehabilitation Act of 1973
RBS	Royal Blind Society
RSB	Royal Society for the Blind of South Australia
SOCOG	Sydney Organising Committee for the Olympic Games
UN	United Nations
US	United States
USA	United States of America
W3C	World Wide Web Consortium
WA	Western Australia
WAI	Web Access Initiative
WARPF	Western Australian Retinitis Pigmentosa Foundation
WCAG	Web Content Accessibility Guidelines
WHO	World Health Organization
WWW	World Wide Web