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Telecommunications for people with disability: This year’s Christopher Newell Prize-winning papers

Peter Gerrand
Managing Editor, TJA

‘An NDIS will ensure people are no longer “shut out” from opportunities and from independence by providing the appropriate and necessary supports that allow people with disability to reach their full potential’ – from the ‘What is an NDIS?’ website May 2013

By the time you read this article, the National Disability Insurance Scheme legislation will have been presented to the Australian parliament and passed, given the statements of support in principle from across the federal parliament. This is great news for all Australian citizens under 65 with serious disabilities.

Telecommunications has had, and will continue to have, a significant role in supporting those with disabilities from being ‘shut out from opportunities and from independence’. It is not widely known that in the early 1980s, a self-styled ‘ComSkill’ group of volunteers arose within Telecom Australia, led by Graeme Malouf and including design engineers Barry Dingle and Graeme Goeby, which designed and built the prototype ‘Access Dialler’ – a telephone with two large pads replacing the normal dial pad so that those unable to use a standard dial pad or keyboard could use their elbows or a prosthetic limb to dial their telephone calls. Telecom’s Managing Director Mel Ward arranged for a production model to be engineered and made available at heavily subsidised rates. Later in the 1980s the ComSkill group designed a very low power, long battery-life communication board for people with speech disability.

Other relevant initiatives have been the Telstra Disability Forum, meeting regularly since 1999, the Telecommunications Industry Ombudsman Disability Action Plan (2003), the Communications Alliance’s industry guideline G586 ‘Disability matters: access to communications technologies for people with disabilities and older Australians’ (2006), and the Australian launch of the Global Accessibility Reporting Initiative by the Australian Mobile Telecommunications Association and Mobile Manufacturers Forum in 2009. In 2003 ACIF (the Australian Communications Industry Forum, predecessor to the current Communications Alliance), set up a Working Group on Any-to-Any Text Connectivity Options, to investigate Internet-era alternatives to the TTY (teletypewriter) service that is supported by the Standard Telephone Service, but neither industry nor government took up its recommendations.

The National Broadband Network, with its high-speed upstream and downstream capabilities, offers great potential for advanced tele-health, assisted communication and tele-education services (as well as sign languages) for those who are relatively immobilised, as well as the means by which people with disability – or their carers – can more effectively manage their lives. The policy challenge is to make the NBN affordable for all those who need to use it – and the National Disability Insurance Scheme will hopefully contribute significantly to the communication costs of those found eligible.
Four years of the Telstra-TJA Christopher Newell Prize competition

In March 2009 the then Parliamentary Secretary for Disabilities, the Hon. Bill Shorten MP, challenged the telecommunications industry to fund an annual competition for the best original paper to be published on the application of telecommunications to help people with disability. Telstra took up the challenge, and has now been funding the Telstra-TJA Christopher Newell Prize competition annually for four years.

The winners of the 1st Prize in the previous three years are shown in Table 1.

<table>
<thead>
<tr>
<th>2010: 1st Prize</th>
<th>Denise Wood</th>
<th>University of South Australia</th>
<th>“Communicating in Virtual Worlds through an Accessible Web 2.0 Solution”</th>
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<tr>
<td>2011: equal 1st Prize</td>
<td>Melissa McCarthy</td>
<td>Royal Institute for Deaf and Blind Children (RIDBC)</td>
<td>“Using technology to support children with sensory disability in remote areas: The RIDBC Teleschool model”</td>
</tr>
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<td>2011: equal 1st Prize</td>
<td>Robert Morsillo</td>
<td>Swinburne University &amp; Telstra Consumer Affairs</td>
<td>“One down, two to go: Public policy in service of an available, affordable and accessible National Broadband Network for people with disability”</td>
</tr>
<tr>
<td>2012: 1st Prize</td>
<td>Rob Garrett and Toan Nguyen</td>
<td>Novita Children’s Services, SA</td>
<td>“Together We Can Find Telecommunication Solutions For People With Complex Communication Needs”</td>
</tr>
</tbody>
</table>

Table 1 – Previous Winners of the Telstra-TJA Christopher Newell Prize

It can be seen that the previous judging panels for the Prize have interpreted ‘telecommunications’ broadly to include the whole range of potential Internet and web-based services based upon modern telecommunications infrastructure. In addition they have interpreted ‘the application of telecommunications’ to include research on policy proposals in telecommunications that could have wide potential benefits for people with disability.

The 2013 Judging Panel has taken a similarly inclusive approach to the topics covered by the six papers submitted to this year’s competition. All six papers are original and valuable, and TJA is pleased to be able to publish all of them in this special issue of the Journal. Of the six, four papers were considered to have sufficient merit to share the $15,000 pool of prize money, which will be distributed as shown in Table 2. TJA congratulates all the winning authors.
<table>
<thead>
<tr>
<th>Prize Level</th>
<th>Winner(s)</th>
<th>Institution(s)</th>
<th>Title</th>
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<tr>
<td>1st Prize</td>
<td>Gunela Astbrink and Will Tibben</td>
<td>GSA InfoComm, University of Wollongong</td>
<td>“The role of public procurement in improving accessibility to ICT”</td>
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<tr>
<td>2nd Prize</td>
<td>Parimala Raghavendra, Emma Grace, Lareen Newman, Denise Wood and Tim Connell</td>
<td>Flinders University, Novita Children’s Services, et al.</td>
<td>“‘They think I’m really cool and nice’: The impact of Internet support on the social networks and loneliness of young people with disabilities.”</td>
</tr>
<tr>
<td>Equal 3rd</td>
<td>Marion Hersh</td>
<td>Glasgow University</td>
<td>“Deaf people’s experiences, attitudes and requirements of contextual subtitles: A two-country survey”</td>
</tr>
<tr>
<td>Equal 3rd</td>
<td>Erin Wilson, Robert Campain, Megan Moore, Nick Hagiliassis, Jane McGillivray, Daniel Gottliebson, Michael Bink, Michelle Caldwell, Bob Cummins and Joe Graffam</td>
<td>Deakin University, Scope, et al.</td>
<td>“An accessible survey method: Increasing the participation of people with a disability in large sample social research”</td>
</tr>
</tbody>
</table>

Table 2 – Winners of the 2013 Telstra-TJA Christopher Newell Prize

Sincere thanks are again due to Telstra for sponsoring the competition, and to the six members of the Judging Panel: Dr Mark Bagshaw, Bert Ciavarra, Barry Dingle, Dr Peter Gerrand, Professor Gerard Goggin and Wayne Hawkins.

Finally, I draw your attention to the fine memoir that Robert Morsillo has separately written on Christopher Newell, which TJA is pleased to publish in this issue. It helps explain why the memory of Christopher Newell continues to inspire people working for improved access for people with disability, especially in the telecommunications sector.

This brief memoir is a personal tribute to the late Rev Canon Dr Christopher Newell AM (1964 – 2008). Being the fourth year of the TJA prize in his honour, and nearly five years since Christopher’s unfortunate death, it seemed timely to again reflect on our relationship and the seminal contribution and challenge, as a person with disability, that Christopher made to the telecommunications industry and to inclusive customer service. I hope this will provide further insight into Christopher’s role and modus operandi as an agent of change; how he characterised himself as a “critical friend” of the industry yet chose to enter into deep personal relationships with people who walked with him as he scooted along on his journey. In Christopher I found a deep conjunction of the personal and the professional, a priest and a professor, a saint and a rogue.

[Note: The views expressed in this paper are those of the author unless specifically referenced.]

Introduction

The relationship between telecommunications technologies and people with disability continues to evolve rapidly. On the one hand, the remarkable innovation taking place with accessibility features for connected smart-phones and tablets (e.g. Apple’s VoiceOver feature) and assistive communications apps (e.g. Proloquo2Go), and the new features being added to the National Relay Service in Australia (cf. Telecommunications Universal Service Management Agency 2013), are proving a boon to many people with disability. On the other hand, the increasing popularity of IPTV, video on demand and other streaming multimedia services in a high-capacity broadband world comes with significant technical challenges in providing consistent captioning and audio-description options across all devices and services. Then there is the nascent National Disability Insurance Scheme (now called DisabilityCare Australia) and its still uncertain relationship to telecommunications services as an important enabler, including for telework (cf. Hawkins 2011; Colmar Brunton Research and Deloitte Access Economics 2012).

It is within these often ambiguous and ambivalent relations between technology and people with disability that Christopher worked. From a very early age his life seemed to be lived in relationship to disability and technology, particularly medical technologies. His father, Bishop Newell, relates:

From childhood he suffered a form of asthma which increased in severity. The drugs which helped to keep him alive, affected his bones. Progressively he suffered increasing levels of pain necessitating more drugs in an attempt to control it. But he used this experience to help fashion his thinking and his
caring. He knew what it was to be a person with a disability. Out of it all came a heart of compassion and a voice of advocacy for others with disabilities (Rt Rev P. K. Newell 2010).

Despite the many difficulties faced, Christopher went on to excel in his scholarship and academic achievements. In 1989 he was awarded a Master’s degree from the University of Wollongong for his thesis “Australian Telecommunications and Disabled People”. In 1994 he completed his PhD at Deakin University analysing the social construction of two specific disability technologies: the wheelchair and the cochlear implant.

Christopher made significant critical and scholarly contributions to the fields of disability studies, medical ethics and technology development (cf. Goggin 2010). He served on numerous bodies, including the Australian Health and Medical Research Council. As Associate Professor in Medical Ethics at the University of Tasmania, he engaged students in the issues of patient care and bio-ethics. He became an intense activist for the rights of people with disability and in 2001 was awarded membership of the Order of Australia “for service to people with disabilities, particularly through advocacy and research, to the development and practice of ethics and to health consumers.”

My own relationship with Christopher began around 1991 when we were two rather raw but hopeful consumer advocates asking a large Australian corporation, which supplied basic telephone services, to change the way it dealt with its low-income customers, on my part, and its disability customers, on Christopher’s part. In that year Christopher joined me on the Telstra Consumer Consultative Council (TCCC), which met regularly with senior management to discuss telecommunications issues for residential consumers. Christopher represented Disabled People’s International (Australia) (DPIA) and went on to become the TCCC Consumer Co-chair. In early 1995, I was asked to join the company and so I suppose our relationship changed in some ways. I was now one of them!

Of course, 1995 was a momentous year for disability rights and telecommunications in Australia. Telstra and people with disability challenged each other in the (now) Australian Human Rights Commission before Sir Ronald Wilson. DPIA, with Christopher advising, had joined the action begun by Geoffrey Scott in what is still regarded today as a defining moment for disability awareness in the Australian telecommunications industry (Geoffrey Scott v Telstra; Disabled People's International (Aust) v Telstra 1995; cf. discussion by Bourk 2000). It has even been made the subject of one of 20 video clips marking the 20th anniversary of the Disability Discrimination Act 1992 (Australian Human Rights Commission 2013). In 2005, Christopher moved to a wider telecommunications industry role, representing consumers on the Telecommunications Industry Ombudsman (TIO) Council and chairing the Disability Advisory Board of the (now) Communications Alliance.

In working for justice alongside people with disability, Christopher was motivated by its foundational basis: “right relations” (cf. McCormick 2003, 8), or as Christopher expressed it, “respectful relationships” between differing groups – such as the telecommunications industry and its disability customers. But Christopher went further than just talking about it, he actually entered into those respectful relationships himself.

And so, our friendship developed. It went from only formal, professional engagement to informal contact, having meals together, discussing issues other than telecommunications. Eventually, my partner, Julie, met Christopher and his partner. We even went to listen to him preach on a Sunday morning in the Hobart Anglican Cathedral. When Julie was undertaking her PhD research, Christopher was most encouraging, particularly in the tough times: he was a genuine priest and professor, at the same time.

“Being other-wise” in the title is meant as a double-entendre. It conveys, first, the sense of being aware of and open to others who are different from yourself, being wise to their presence. This was what Christopher was asking from corporates in respect of their disability customers. Second, it conveys the sense of a personal style of being different, confronting and contrary, resisting the status quo. Christopher had both this openness and personal style.
I remember wondering, when planning the award ceremony for the inaugural Christopher Newell Prize for Telecommunications and Disability in 2010, what venue to book to take Christopher’s family and others for dinner afterwards. So, I jumped online looking for restaurants near to the venue and when I saw the name of one such, called “The Saint and Rogue” (2013), I knew I had found just the right place for dinner in Christopher’s honour (at least after checking that it was wheel-chair accessible)!

The title also picks up the theme of one of Christopher’s major public lectures: “From other to us: Transforming disability in Australia” (Christopher Newell 2005), which I was privileged to hear him deliver at the Centre for Public Policy, University of Melbourne. I want to explore this theme a little more with the warmest regard for those times of deep conversation when I would walk and Christopher would wheel or scoot(er) along the sidewalk in his “chariot”. He was most chuffed that he could outpace me just by pushing a little harder on the accelerator and get to our destination well before me. Walking was such a disability in comparison, he would remind me!

‘From other to us’

Christopher’s bone of contention was that service providers, whether government or commercial, would often treat people with disability as those other, special, customers who stand outside of the mainstream and whose needs only rate an afterthought. Stabile (2009) gives a useful definition:

When I talk about the “other” and “othering,” I am not referring to the bare psychological process by which an individual establishes her identity by distinguishing between the self and other persons. Rather, I am talking about a process by which individuals and society view and label people who are different from them in a way that devalues and dehumanizes them ... if, instead of proceeding from a view of others as fundamentally “not us,” we possessed an attitude of valuing others and as seeing them as not separate or other, our views on any number of issues of public policy might be very different (Stabile 2009, 2).

Of course, in Australia today, “issues of public policy” might include asylum seekers, Indigenous communities, GLBTI communities, single parents, as well as people with disability.

Service providers can quite easily think of customers as “other”. Things are often done “to” customers, not “for” them (better) or “with and by” them (best). They can be impersonalised into “systems”. They can be invisible in the spreadsheet calculations of averages and cost-benefits. They can miss out through the priority attention given to the majority rather than to the finely detailed and diverse “long tail” (cf. Pozzi & Bagnara 2013). Sometimes industry may think it knows what’s best for “them”, usually on the basis of what’s most efficient for the supplier, rather than listening to and taking a cue from their lived experience and adjusting systems and behaviours to suit. As the digital economy and prevalence of off-shoring grows, there is a danger that the customer becomes increasingly distant and virtual, rather than someone real with whom the quality of the relationship is foremost. Christopher would have been in his element today contributing to the recent renewed focus on improving customer service by Australian telecommunications service providers (cf. Australian Communications and Media Authority 2011). He argued that:

Disability is often conceptualised as a specialised, technical issue, the subject of policies to do with inclusion, special accommodations and government strategies that suggest “we care”. Yet in order to transform disability in Australia we need to tackle our deep-seated fears, moral convictions and relationships. We need to seek to transform people with disability from “other” outside of the moral community, to part of “us”, the nice, normal and even natural (Christopher Newell 2005, 1).
Christopher was perhaps right to focus his attention on the telecommunications industry, knowing that technology drives most developments, which are therefore often characterised as “specialised, technical issue[s]”. Yet, he also knew that in providing the ability to connect across vast distances, and across various human barriers, telecommunications offers the means to build those “relationships” that form and transform communities.

**From us to other?**

While Christopher’s “From other to us” is an important and useful way for corporations to think about becoming inclusive of all their customers, I want to suggest that the concept has another angle that provides the basis for innovation in customer service, and communications products and services.

Awareness of the other underpins our awareness and acceptance of diversity. As Christopher might have put it one Sunday morning: a theology of creation-as-good, all parts of it, made in the Other’s image, whether red or yellow, black or white, male or female or anywhere in between, with ability or disability or anywhere in between. This was fundamental to Christopher’s ethics, his stand against utilitarian euthanasia, against abortion on the basis of genetic testing: that the different and the diverse are ultimately good and still part of “us”.

So, rather than transforming an “other” into an “us”, which sounds like a form of integration, I suggest we also need to recognise, respect and have a right relationship with the continuing “other”, which is, of course, justice by another name. Christopher, through his work, wanted to put people with disability at the centre of communications developments (cf. Goggin 2008) and this type of thinking, in principle, is gaining recognition even in areas of high technology. I most recently heard it from Alice White, Chief Scientist, Bell Labs, which is one of the most renowned ICT research and development institutions in the world. White spoke about evolving from a linear commercialisation process, with the customer only at the end, to an ecosystem for innovation: “Bell Labs has embraced an iterative cycle that firmly connects research to customers” (White 2011, 10). Christopher might have had a wry smile seeing the inventive tradition of Alexander Graham Bell finally giving precedence to customer requirements rather than seeking to impose generic, “normal”, solutions upon cultural and communications differences. Other examples, closer to home, of trying to give precedence to the user environment come from seeking to analyse and modify the Standard Telephone Service from the viewpoint of Indigenous communities and culture (Morsillo 2008) and seeking to design accessible telephone handsets for both home and mobile use (Morsillo et al. 2010).

Central to this inventiveness or innovation is the concept of dialogue, between individuals, who can walk and wheel together, but also between service providers and their customers. Sometimes it is called consultation, or community engagement, or deliberation, or public participation. But what is real dialogue?

**A third way?**

David Bohm, a famous physicist, in his little book, *On Dialogue* (1996), offered a new perspective on addressing difference and conflict by proposing a form of dialogue that is focussed not just on breaking down barriers through a two-way conversation but on creating something new.

...in a dialogue, each person does not attempt to make common certain ideas or items of information that are already known to them. Rather, it may be said that the two people are making something in common, i.e., creating something new together (Bohm 1996).

This is the essence of innovation, through collaboration, creating something new from the contributions of all, diverse, participants. The recognition that creativity arises at the interstices, the junctions, the orthogonal touch points between differing organisations,
peoples, disciplines and so on. It comes about by dialogue, proper dialogue in the Bohm sense, of not talking at each other, not just listening to each other’s point of view, not trying to influence the other to our point of view, but both contributing to something genuinely new: an innovation, a solution, perhaps an improved communications device or customer service process. An initiative that incorporates, in this case, both disability and non-disability characteristics, but which does not diminish either.

Corporations often fuss over their stakeholder management strategies, which may involve only one-way messaging. Some may go to the next step of stakeholder engagement, which, similarly, is often based on an influencing model. Perhaps a few may recognise the desirability or even priority of innovation and take the next step towards a model of co-creation or co-production with their customers and stakeholders.

One of the challenges in getting to this point is often the different world views, different languages, different priorities and so on at stake between the corporation and the consumer or community. This highlights the need for negotiators, or brokers: people who stand between. Geoff Mulgan, Adelaide thinker in residence 2007-08, calls them “connectors” in his opus on social innovation, calling out:

...the critical role played by the connectors in any innovation system – the people and institutions which link together different people, ideas, money and power. If we stand back and look at the whole system of innovation and change it’s clear that they often play more important roles than the individual entrepreneurs, thinkers, creators, designers, activists and community groups, even if they are often less visible.” (Mulgan 2007, 35).

Christopher was one of those “connectors” who acted as a go-between, interpreting for those of us who do not have the language or lived experience of disability. He personified what I aspire to be as a “connector”: someone who understands the ethical, engaged and innovative corporation and can represent it; understands the customer, the consumer, the community and can represent them; can listen for and understand what is at stake (i.e., the “stake” in stakeholder); can translate between; can look for common ground; and can construct “win-win” scenarios that are genuinely new (Morsillo 2011, 3-4).

**Conclusion**

I want to respectfully suggest that the concept of the “other” has a positive dimension in support of diversity and innovation. I also want to suggest that Christopher’s contribution to the telecommunications industry provides tremendous encouragement and inspiration to continue to build bridges across the divides, through friendship, acceptance and respect, working as an ethical broker, someone who can go-between. The advent of the National Broadband Network and DisabilityCare Australia, two of the largest public policy initiatives in Australia’s history, highlights the importance of the work still to be done to bring about “right relations” between technology and disability.

Sometimes I could not agree completely with Christopher. He had his “roguish” streak, occasionally wanting to “put a bomb” (figuratively speaking, of course) under people he fiercely disagreed with. He seemed to have some absolutes in a world I thought wasn’t ruled by absolutes. Yet, this was part of my great respect for him. For example, he held the line on the right to life, interpreted in the most positive way as meaning the right to support and resources to have the best possible life one could have, no matter what the disability or other debilitating circumstances. He argued for better care, for better pain relief, with his own body challenging the inadequate state of the art in medical treatment, not to mention airline travel. He showed a compassionate way forward, an alternative to an easy, uncaring, unaware, way out. He would not let the system off-the-hook, not allow it to dismiss people with disability as “not my problem”. Christopher was one of those people who stood in the breach and taught us what doing that means in practice. It was a privilege to know him.
References


Morsillo, R; Ciavarra, B; Newton, C; Raimondo, J. 2010. 'Fixed and mobile innovation through user representation: Two case studies'. Telecommunications Journal of Australia 60 (1): pp. 10.1–10.11. doi: http://dx.doi.org/10.2104/tja10010.


Endnotes

1. GLBTI. Gay Lesbian Bi Trans Inter sexual orientation

The role of public procurement in improving accessibility to ICT

Gunela Astbrink
GSA InfoComm
William Tibben
University of Wollongong

Government bodies use public procurement policies and mechanisms to purchase ICT products and services. Some governments in OECD countries apply accessibility criteria when procuring ICT to improve access to their services and employment opportunities for people with disabilities. This may have a flow-on effect of greater availability of affordable and accessible ICT thus improving digital inclusion. This paper outlines research on comparative analysis of the situation in Australia with current policy in OECD countries. The research resulted in recommendations for a consumer-oriented plan to work with Australian governments on the introduction of accessibility criteria in ICT public procurement.

Introduction

Government purchasing of Information and Communication Technologies (ICT) can influence the widespread availability of affordable and accessible ICTs for people with disabilities. Accessible ICTs are defined in this paper as:

information and communications technologies (ICTs) that enable people with disabilities to use functions provided by computer hardware and software on an equal basis with others (EU 2011a).

In general, increasing the availability of accessible ICTs is considered a positive step in removing barriers that prevent people with disabilities from participating equitably in society (Hawkins 2011; Waddell 2009) and thus increasing digital inclusion. Government purchasing, usually called public procurement, refers to the processes that governments engage in to purchase goods and services, mainly from the private sector, to enable them to carry out various functions (McCrudden 2007: 2-3). The primary aim for including accessibility criteria in ICT public procurement is to provide more equitable access to ICT office equipment such as phones and computer systems for public servants with disabilities. However, it can have flow-on effects for increased ICT accessibility to the broader community.

In order to better understand the context in which ICT government purchasing occurs it is useful to look more broadly at the topic of public procurement. Government, by virtue of its spending power, represents a significant player in the economy and can influence the availability and costs of goods and services. Government is able to do this by virtue of the various roles it plays as a:

- buyer of goods and services
- supplier of services and
- regulator (McCrudden 2007: 2; EU 2011b).

Each of these leads to the possibility that economies of scale may emerge from public procurement that will eventually flow to the general market.
The use of public procurement to shape social outcomes is not new (McCrudden 2007: 4). Recent developments in the European Union (EU) indicate that the use of public procurement to further social goals is still very much on the agenda there (EU 2010: 5). However, the use of public procurement to singularly create additional demand for accessible ICTs is relatively recent (Waddell 2009) and untested in the Australian context. By drawing on the experience of other countries, the authors investigated the use of ICT accessibility criteria in public procurement throughout OECD countries (Tibben & Astbrink 2012). In addition to the 86-page report of this research, an advocacy toolkit was developed for use by disability organisations.

The paper therefore summarises key parts of this research. It begins by briefly explaining the research design. The paper then moves on to reporting the findings of the comparisons made between OECD countries in their use of ICT accessibility criteria in public procurement. In order to provide a more informed context in which to consider the Australian case, the paper reports on key parts of in-depth studies of selected cases as well as commentary from experts. After providing a summary of ICT accessibility provisions in public procurement in Australia the paper details the outcomes of focus group research that drew on the knowledge of members from key organisations that represent the interests of people with disabilities. The paper concludes with a discussion that distils the major research findings and recommendations from the research for Australian governments.

**Research design**

A mixed methods research design was employed to collect up-to-date information about accessibility in ICT government purchasing in OECD countries including Australia. Four principal methods were applied to the research design: systematic review (Petticrew and Roberts 2006); benchmarking (Wainwright et al. 2005; Andersen et al. 2008); case study (Creswell 1998; Yin 2009); and focus groups (Barbour and Kitzinger 2001).

The systematic review phase of the research was designed to identify and summarise key English language sources from OECD member countries. These were analysed using criteria that enabled countries to be benchmarked in their use of ICT accessibility criteria in public procurement. This part of the research, in turn, identified cases for in-depth case study analysis. Cases were chosen on the basis of their learning potential. Diverse cases were summarised to provide a comprehensive understanding of ICT accessibility criteria and the different ways in which they were applied.

In order to obtain the most in-depth understanding of the Australian case both focus group research and interviews were used to complement the literature search. The experiences of people with disabilities in obtaining appropriate ICT workplace modifications were explored using focus groups made up of people with disabilities and representatives from disability organisations in Australia. Interviews were conducted with key stakeholders from government and industry.

**The study**

**Benchmarking of OECD countries**

Benchmarking was undertaken to provide a global perspective on the ways ICT accessibility criteria are applied to the purchase of ICTs by national governments that are members of the OECD. ICT accessibility policies from these countries were systematically reviewed in order to determine key attributes of each. Information could not be obtained from all OECD countries. Information searches for Chile and Mexico yielded insufficient information to reasonably include these two countries in the benchmarking.

Table 1 summarises the findings. The findings include the monitoring mechanisms, as this has a significant bearing on the application of accessibility criteria in public procurement. It can be seen from Table 1 that only two countries, the USA and Japan, were found to have
The role of public procurement in improving accessibility to ICT

comprehensive accessibility criteria that are mandatory in public procurement. Comprehensive accessibility criteria indicate that detailed standards were used. In the case of the USA, the application of these laws extend only to federal authorities while in Japan it appears that all levels of government are required to apply these laws. Further, it can be seen that the monitoring of the application of these laws yields two different scenarios. In the case of the USA, the use of an online procurement system called the **Buy Accessible Wizard** enables ICT purchases by federal government authorities to be tracked and checked. In the case of Japan, it is not possible to find an official mechanism for monitoring compliance with their procurement laws. Indeed, **Yamada (2011)** comments that the Japanese market is flooded with inaccessible ICTs and related services as a consequence.

The second category of ICT accessibility criteria includes more countries: Italy, Norway, Sweden and Spain. ICT accessibility criteria in these instances were not prescribed by detailed standards or criteria but were more generally described. By way of example, Spain and Italy have broadly followed the Section 508 provisions but have not adopted the standards in their entirety. Norway has used the principles of universal design to describe ICT accessibility criteria. In Sweden’s case, ICT accessibility concepts are laid down in equal opportunity law. These countries have also chosen different means by which to monitor compliance with these laws. In Italy, monitoring is the responsibility of equal opportunity authorities. In the case of Sweden and Norway, public administration authorities are responsible for monitoring the application of accessibility criteria in public procurement. In the case of Spain, it was not possible to find evidence of monitoring.

<table>
<thead>
<tr>
<th>ICT accessibility criteria comprehensively described in public procurement law</th>
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<td>External monitoring regime that makes a commitment to publish results</td>
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<td>Internal monitoring regime that makes a commitment to publish results</td>
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<tr>
<td>Internal monitoring regime – but no commitment to publish results found</td>
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<tr>
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<tbody>
<tr>
<td>Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany,</td>
</tr>
<tr>
<td>Hungary, Ireland, Luxembourg, Netherlands, Poland, Portugal, Slovakia, Slovenia, Switzerland, United Kingdom.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ICT accessibility criteria NOT found in public procurement law</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia, Canada, Israel, Republic of Korea, New Zealand, Turkey</td>
</tr>
</tbody>
</table>

**Table 1** - The application of ICT accessibility criteria in public procurement law within the OECD.
The third category of ICT accessibility criteria comprises countries in which ICT accessibility is merely acknowledged in public procurement. This category has the largest number of countries. This is primarily by virtue of a European Union (EU) Directive on Public Procurement issued in 2004 that has been adopted by EU member countries. EU Directive 2004/18/EC required EU member countries to adopt, along with other clauses, the following clause (29):

.Contracting authorities should, whenever possible, lay down technical specifications so as to take into account accessibility criteria for people with disabilities or design for all users (EU 2004).

It is perhaps axiomatic that the absence of specific ICT accessibility requirements in procurement processes has not lead to a complementary need for monitoring of compliance. Therefore, there was little need to further categorise these countries on the basis of their monitoring mechanisms.

The countries that had not adopted ICT accessibility criteria in their public procurement laws were in the minority. Notably, Australia is found in this group. Some of these countries’ governments have opted for voluntary strategies to encourage the use of accessibility criteria when procuring ICTs. The federal government in Canada has sponsored the development of an online toolkit designed to guide purchasers through procurement decisions that are based on ICT accessibility principles. However, the final decision to adopt such principles is left to individual federal departments (D'Aubin 2007). In the Republic of Korea, a set of national ICT accessibility standards have been developed but these are not mandatory in public procurement.

It is anticipated that the rankings of countries in Table 1 will change over the coming years, particularly in Europe, where considerable preparatory work has been undertaken to develop ICT accessibility standards for eventual implementation.

In the course of the research it became obvious that web accessibility criteria had been applied in many countries (Tibben & Astbrink 2012: 18-19). This was seen in the variety of ways that web accessibility guidelines have been codified in administrative regulations (particularly e-Government strategies) as well as equal opportunity law (see Table 2).

<table>
<thead>
<tr>
<th>External monitoring regime that makes a commitment to publish results</th>
</tr>
</thead>
<tbody>
<tr>
<td>France, Germany, Netherlands, Switzerland</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Internal monitoring regime that makes a commitment to publish results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austria, Czech Republic, Denmark, Germany, Hungary, Ireland, Italy, Republic of Korea, Norway, Portugal, Slovakia, Sweden</td>
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</table>

<table>
<thead>
<tr>
<th>Internal monitoring regime – but no commitment to publish results found</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia, Canada, Greece, Iceland, New Zealand, Slovenia, United Kingdom</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Evidence of monitoring regime was not found</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estonia, Luxembourg, Spain</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Web accessibility criteria NOT found</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium, Finland, Israel, Poland, Turkey</td>
</tr>
</tbody>
</table>

Table 2 - Web accessibility criteria described in other areas of law
It is encouraging to note that the majority of countries have embraced web accessibility standards largely adopted from W3C’s Web Content Accessibility Guidelines (WCAG) 2.0. However, web accessibility criteria are but a limited subset of the full range of criteria required for ICT that are used by governments (and the private sector).

**International case studies**

There are a number of challenges that make the mandatory adoption of accessibility criteria when purchasing ICTs (or related services) less than straightforward. The in-depth study of contrasting cases provided a more nuanced appreciation of these challenges in the different approaches countries had taken to ICT accessibility criteria.

The United States is still considered a pre-eminent example of a country that has legally enforceable ICT accessibility standards as reflected in their so-called Section 508 legislation. The relevant legislation from which Section 508 is drawn is the Rehabilitation Act of 1973. In 1998, amendments to Section 508 saw the creation of a set of enforceable accessibility standards that were embedded into federal procurement regulations in 2001 (Fotopolus 2006, 98).

In 2006, the realisation that Section 508 standards were being challenged by new technologies led to a review called the ‘Section 508 Refresh’. This was done by the US-government supported Telecommunications and Electronic and Information Technology Advisory Committee (TEITAC). TEITAC’s brief was to review and update the standards that underpin both Section 508 of the Rehabilitation Act and Section 255 of the Telecommunications Act 1996. (Section 255 of the 1996 Telecommunications Act relates to accessible telecommunications equipment for people with disabilities). TEITAC also considered new and converging technologies. These included:

- self-service machines and kiosks
- the growing market of gesture-based interfaces, such as touch screens
- the emerging trend in digital or biometric identification as an alternative to password protection
- hand-held devices and access for people with limited dexterity and refreshable Braille
- access for people with cognitive disabilities

Another significant change that TEITAC made was ensuring that standards better address rapid technological changes. The Committee moved from specific product categories to product characteristics. This means that an Apple iPhone is not forced into a category such as mobile phone, computer or PDA but is described by characteristics that have accessibility requirements attached to them (Maguire 2008).

The compliance regime of Section 508, combined with the buying power of the U.S. Federal Government, are compelling factors that manufacturers respond to. Recent comments from US manufacturers suggest that they appreciate the greater certainty that Section 508 accessibility criteria provide (COAT 2012).

The Business Taskforce for Accessible Technology (BTAT) in the United Kingdom has promoted ICT accessibility criteria as a key component of future productivity. The business benefits that they cite are improved interactions with new and existing customers, greater loyalty and productivity from employees, improved business processes within the organisation and improved financial outcomes (Ashtington 2009). Support of the BTAT Accessible Technology Charter from companies such as Cisco, Microsoft, SAP, Oracle and Logica indicates the level of support for Charter features such as accessibility in procurement practices. Notably, the taskforce is responsible for developing a toolkit that enables businesses to assess their level of accessibility readiness through an Accessibility Maturity Model.

The experience from the European Union is one that favours the introduction of ICT accessibility criteria in public procurement across member countries. The fragmentation of markets that can occur because of multiple standards and the resultant inefficiencies is one driver for the adoption of Europe-wide ICT accessibility criteria (EU 2011b). The EU’s
Mandate 376 has directed European standards bodies to investigate the development of a detailed standards framework that can be applied in public procurement (EU 2005). This is to be harmonised with Section 508 standards as much as possible. The European Accessibility Act is under consideration by the EU and this may have an impact on the adoption of ICT accessibility criteria in future (EU 2011b).

The case studies detail the benefits of including mandatory accessibility criteria in public procurement policy and found that voluntary accessibility criteria did not produce similar effects to mandatory criteria (Tibben & Astbrink 2012: 64-68). Even in cases where legislative force underpinned ICT accessibility, compliance was found wanting because monitoring and sanctions were inadequate (Yamada 2011; NDA 2009). It is important to note that mandatory accessibility criteria refers to a requirement by government procurement officers to incorporate these criteria into purchasing requests for tender. It does not mean that companies are required to meet all the criteria. However, meeting more criteria provides them with a sharper competitive edge.

The report argues that applying mandatory accessibility criteria in ICT purchasing signals the government’s commitment to improving equality for people with disabilities. As an employer, many of the hurdles that currently exist in making one-off adjustments become less important as the technology and techniques that enable greater accessibility become mainstream. This enables employers to recruit from a wider pool of potential employees and better recognises the skills and knowledge individuals bring to the workplace. Disability Discrimination Commissioner Graeme Innes (2011) describes this as not only a beneficial outcome for people with disabilities but also economically advantageous to the public and private sectors.

Focus on Australia

Australia is grouped with countries that do not make specific reference to accessibility criteria for ICTs in their public procurement procedures.

It is in the area of web accessibility that Australia has taken more tangible steps. The Web Accessibility National Transition Strategy requires Federal Government websites to conform to the requirements of WCAG 2.0. The timetable for compliance has been set for W3C level A compliance by the end of 2012 and level AA by the end of 2014. As discussed previously, Australia is not unique in limiting its efforts to just web accessibility. The danger exists that assumptions may be made about the sufficiency of web accessibility initiatives. Some people may assume that the coverage of web accessibility guidelines extends to all computing and telecommunications hardware and software - which it does not.

The United Nations Convention on the Rights of Persons with Disabilities (UNCRPD) exemplifies a rights-based approach to improving equality for people with disabilities. Australia ratified the Convention on 17 July 2008 and ratified the Optional Protocol of the UNCRPD on 21 August 2009. This obligates Australia to put in place legislation to promote equality, to eradicate areas of discrimination, to promote awareness of these issues through training and research and to consult with and involve people with disabilities in developing legislation and policies. The primary legislative instrument that seeks to give legal effect to Australia’s commitment to the UNCRPD is the Disability Discrimination Act 1992 (DDA), which is administered by the Australian Human Rights Commission. The DDA, among other things, “protects against unlawful discrimination of people with disability in the workplace” (HREOC 2005: 31).

The Australian Government has been criticised for its poor record in employing people with disabilities (Dunlevy 2011; ADDE 2012). The Australian Public Service (APSC) Commissioner’s Statistical Bulletin shows employment of people with a disability in the Australian Public Service has dropped from a high of 5.5 per cent in 1996, to 3.1 per cent in 2010 (APSC 2010).

Focus group research carried out as part of this research was designed to capture information about the experiences of people with disabilities when seeking employment and when in employment. While the focus was not exclusively on those who had worked for the
Australian Public Service, the accounts of focus group participants were illuminating for the frustration that many had experienced. As one participant stated:

“good people leave the public service because they are demoralised – not getting support for equipment, there is inaccessible software and promises to change work practices which do not occur.”

Other stories from participants were consistent with this theme. One person was dismayed to discover that there was a departmental policy disallowing access to Skype that she used on a regular basis. Another focus group participant complained that IT support staff were not conversant with the technicalities of their assistive technology software. Specific mention was made of delays in the installation of screen reading software because there were issues that were related to the software’s need to traverse the department’s firewall. The latter example suggests that there has been some breakdown in ICT systems management. Under the Information Technology Infrastructure Library (ITIL), which is the information technology management regime in place within Federal agencies, all software (including assistive technology) is required to be tested with other departmental systems for compatibility as a matter of course. It appears that the isolated and one-off nature of reasonable adjustments has not led to the kind of expertise development required to adequately manage assistive technologies for people with disabilities.

The theme of insufficient technical expertise in relation to assistive technologies was also apparent when focus group participants spoke about their experience with reasonable adjustment interventions. JobAccess is a government agency that is responsible for assessing the needs for workplace modification and specialised equipment when people with disabilities have been successful in winning a position. While it was agreed that the process of obtaining workplace modifications has improved considerably over the past few years, there are still delays in getting the needed equipment. Often employers did not start the purchasing process until after the new employee had commenced work even though it was possible to do so earlier. A focus group participant stated that people still needed to be good at promoting their need for workplace modifications to JobAccess. In many cases, an employee with a disability may need to wait for up to a month before the workplace modifications are in place. This is because of the assessment, purchase and installation time frames.

In summary, the focus group outcomes indicate that the transition to employment could be improved through IT policies and reasonable adjustments interventions informed by improved technical knowledge of assistive technologies. Given that the experience of a transition to a new job is stressful for all, initiatives in this area would reduce inequities that people with disabilities face. Once in employment, the benefits of better informed IT policies will enable people with disabilities to effectively do their work.

The issue of ICT accessibility has been given renewed attention in the Federal Government’s National Disability Strategy (NDS) (Council of Australian Governments 2011). The first section of the NDS relates to inclusive and accessible communities. The importance of ICTs is acknowledged in Policy Direction 5 and the promotion of the principles of Universal Design in procurement is listed as an area for future action.

The National Disability Insurance Scheme represents a logical vehicle by which the benefits of accessible ICTs can be realised. While the emphasis of this research has been on the Australian Government, ultimately all public service agencies and private sector organisations should adopt procurement policies that make the purchase of accessible ICTs the norm. The removal of barriers to information access and employment that are promulgated by inadequately provisioned ICTs will provide a significant improvement in the lives of people with disabilities that are consistent with Australia’s ratification of the UNCRPD.
Discussion – Plotting a path forward

The basic rationale for introducing accessibility criteria into the public procurement of ICTs centres on the bargaining power of governments (Yamada 2007). As manufacturers respond to the demand from Government for more accessible ICT products, these products will then become more broadly available thereby the price of accessible ICTs is reasoned to fall thus increasing affordability to the general community. While this reasoning intuitively makes sense, it is also supported by innovation theory (Edler and Georgiou 2007; Edler et al. 2005).

The commercial impetus for innovation in accessible ICTs will increase significantly if accessibility standards are agreed upon in major markets. Australia is a net importer of ICT and does not have a strong background in ICT manufacturing (ACS 2010). In being able to piggyback on the efforts of the United States, Japan or countries in the EU, economies of scale and improved knowledge development will be extended to Australia with its relatively small population base. The only way that this outcome can be guaranteed is if Australia adopts accessibility criteria in its purchasing arrangements. Otherwise, Australia may find itself in the invidious position of becoming a dumping ground for ICTs that are non-compliant with the requirements of these other countries.

The standards-setting work in the USA, Japan, the Republic of Korea, and the EU is a rich source of knowledge that is available for use in Australia. Given the economies of scale that each of these countries has in manufactured ICT products (as well as Australia’s reliance on ICT imports) it makes sense for Australia to benefit from the achievements of these other countries. However, the research suggests a number of qualifications to this proposal.

Implementing a policy for the inclusion of mandatory ICT accessibility criteria in public procurement will present some logistical challenges. Yamada (2007, p. 7) describes it as the tension between setting broad functional criteria as opposed to detailed quantitative criteria. Broad functional criteria challenge the norms of public procurement procedures that rely on detailed specifications to enable comparisons to be made between competing tenders. Thoren (2007) states that mainstreaming of ICT accessibility criteria in public procurement should recognise the need for dialogue between government, business and people with disabilities to address questions as they arise. Sweden’s use of ‘framework agreements’ seeks to achieve this by formalising dialogue and negotiation that broadens the opportunities for information exchange between key actors beyond the constrained nature of competitive tendering processes.

Ignorance of accessible products and their potential was a key finding of the research. The task of educating stakeholders (such as designers, vendors, government purchasing officers, IT support staff) about the technicalities of accessibility is made difficult by the absence of training in this area. In much the same way that the US Section 508 standards have led to opportunities for training providers to address this knowledge deficit in the USA, governments in Australia can similarly provide strong incentives for training organisations to provide tuition in ICT accessibility and universal design. This will encourage an understanding of the role of accessible ICT in improving digital inclusion.

In recommending a strategy that builds on the work of other countries, it is assumed that Australian experts maintain contact with the progress of standards development overseas so that latest improvements are localised in a timely and efficient manner. Indeed, the specialised nature of ICT accessibility standards suggests that this should not be left up to interested individuals to pursue but should be developed as a formal initiative sponsored by Government. Disability advocacy groups must play an integral role in advising their members about ICT accessibility criteria in public procurement (Goggin and Newell 2000). With an informed membership, scrutiny of governments at all levels in Australia as they address accessibility criteria in ICTs will increase. Breaches will be identified more readily thereby placing pressure on the public and private sectors to maintain higher standards of accessibility in ICTs.

Accessibility criteria in public procurement of ICTs strengthen the government’s commitment to current and prospective employees in the public service. The experience from the UK
suggests that the benefits extend beyond people with disabilities to all staff where there is a visible commitment to supporting individuals and the attributes they bring to the workplace (Ashington 2009). Given the role that the Federal Government plays as a model employer in the Australian context, its policies in relation to the provision of accessible ICTs for employees with disabilities are significant in providing leadership to other government jurisdictions and the private sector. The new National Disability Insurance Agency could act as a role model in accessible workplace practices including the requirement that ICT being purchased by the Agency has appropriate accessibility features.

**Conclusion**

Paralympian Kurt Fearnley in his 2013 Australia Day Address shone a light on Australia’s “damning” record where 45% of people with disability live on or near the poverty line compared with 22% in OECD countries due in part to high unemployment rates. (Yamine 2013).

It is anticipated that universal adoption of ICT accessibility criteria in procurement processes by the public and private sectors will help to increase employment opportunities for people with disability and should gradually lead to the widespread availability of accessible and affordable ICTs. The positive effects of such a strategy should mean increased digital inclusion for people with disability in many aspects of life. The time is ripe for further research that tests the propositions outlined in this paper.

While mandatory ICT accessibility criteria provide the strongest incentives for compliance, it is recognised that negotiated change with cooperation from industry at the various stages of implementation will be key to future success. Consistent and uniform accessibility criteria will provide greater certainty for vendors and manufacturers to invest and compete thereby creating a sustainable commercial context for the supply of accessible ICTs.

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Edler, J; Ruhl, S; Hafner, S; Rigby, J; Georghiou, L; Hommen, L; Rolfstam, M; Edquist, C; Tsipouri, L; Papadakou, M. 2005. 'Innovation and public procurement: Issues at stake'. Germany: Fraunhofer Institute of Systems Innovation Research. http://dx.doi.org/10.1016/j.respol.2007.03.003


Endnotes

1. The definition is adapted from the European Disability Strategy 2010-2020 which broadly defines accessibility as meaning that ‘people with disabilities have access, on an equal basis with others, to the physical environment, transportation, information and communications including technologies and systems (ICT), and other facilities and services in line with Art. 9 of the UN Convention on the Rights of Persons with Disabilities (UNCRPD)’ (EU 2011a).

2. Narasimhan (2010) provides a useful introductory text to the topic of ICT accessibility criteria. A web version is available, along with other relevant resources, from www.g3ict.org

3. The funding for this study was provided by the Australian Communications Consumers Action Network (ACCAN) Grants Scheme.


‘They think I’m really cool and nice’
The impact of Internet support on the social networks and loneliness of young people with disabilities

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Flinders University
Emma Grace
Novita Children's Services
Lareen Newman
Flinders University
Denise Wood
University of South Australia
Tim Connell
Disability Services SA

Today, young people use the Internet for social networking, learning and recreation. Young people with disabilities have fewer friends and reduced social networks. The aim was to investigate the effectiveness of one-on-one training to increase the use of the Internet by young people with disabilities to enhance their social networks and reduce loneliness.

Eighteen young people aged 10-18 years with cerebral palsy, physical disability or acquired brain injury completed a social networks inventory and level of loneliness measure. Participants received assistive technology and training at their home to learn to use the Internet for building social networks. Post intervention testing revealed that the number of online communication partners increased significantly; however, there was no difference in measured levels of loneliness.

Future research with larger number of participants with disabilities needs to be followed up longitudinally including investigating the meaning and role of online social connections for this group.

Introduction

Adolescence, a time for significant change physically and emotionally, is also when peer relations and identity become important. Recent research with adolescents highlights that relationships with friends are important for their overall health and well-being and social adjustment (Corsano et al. 2006; Waldrip et al. 2008). In a survey by Helseth & Misvaer (2010) adolescents emphasised the importance of peer relations to promote and sustain their quality of life.

Connectedness with friends has been recognised as an important aspect of life participation for young adults with disabilities (Newman et al. 2011). Studies have shown that young people with cerebral palsy and other disabilities worry about making friends and have smaller social networks (McMaugh & Debus 1999; Raghavendra et al. 2011a; Thirumanickam et al. 2011). They have also been shown to have fewer reciprocated friendships and are more isolated than their peers without disability (Nadeau & Tessier 2006). Young people with disabilities with and without complex communication needs tend to have fewer friends and acquaintances compared to their typically developing peers (Raghavendra et al. 2012a), and those who use augmentative and alternative communication may be at higher risk of
loneliness due to limited communication abilities (Cooper et al. 2009). This can be due to many personal and environmental factors including increased reliance on family and paid caregivers to access social situations resulting in limited opportunities for young people with disabilities to develop friendships (Blum et al. 1991). In a recent qualitative study examining transition issues for young people with disabilities, parents recognised significant challenges in helping their children with disabilities connect with others and identified supporting the development of social networks as a key priority (Rhem 2012). Previous research in adults with acquired disability has identified reduced social networks following injury as a concerning indicator of increased social isolation (Vickers 2010).

Today's young people use the Internet via their smart phones, tablets or computers ubiquitously for social networking, leisure and recreation and for information gathering (ACMA 2009a; ACMA 2009b; Barnfather et al. 2011). Almost all Australian teenagers regularly use social networking (90% of 12-17 year olds in 2009: ACMA 2009b). Among young Australians with a disability, this rate may be less: in 2009, 90% of those aged 15-24 recorded using the Internet at least once in the previous 12 months; only 59% of those with a profound disability aged 15-34 use the Internet, but 85% of those with a mild disability do (ABS 2012). The National Longitudinal Transition Study-2 of young adults with disabilities from the US reported that 32% of the participants who were post-high school used electronic communication at least daily whereas 46% used it less than once a week (Newman et al. 2010).

Some of the challenges in making and maintaining friends and strengthening social interaction for children and adolescents with physical and/or multiple disabilities, could potentially be overcome through Internet social networking. The Internet could provide an opportunity for asynchronous communication without prejudice and time pressure (Barnfather et al. 2011; Lewis 2010; Raghavendra et al. 2012b). The young adults with disabilities in Cooper et al.'s study (2009) highlighted the importance of Internet technologies in developing friendships and reducing feelings of loneliness.

Internet use in young people with disabilities is an under researched area. The authors have conducted a pilot study via postal and phone surveys and interviews on Internet use patterns, enablers and barriers in 10-18 year olds with cerebral palsy (CP), muscular dystrophy (MD) and acquired brain injury (ABI) (Newman et al. 2010; Raghavendra et al. 2011b; Raghavendra et al. 2012b). Results showed that 95% of participants used the Internet, for purposes such as instant messaging, emailing, homework, using YouTube, and social networking with existing friends and family. The main factors enabling use were support from siblings and friends. The main barriers were family-level computer/Internet literacy and resources, and some disability-related factors (Raghavendra et al. 2012b).

A UK study asked 14 young adults with CP above 18 years of age about their experiences and challenges in using online social networking (Lewis 2010). The findings showed that the participants used primarily Facebook, for up to six hours a day at home, place of work or educational settings. They communicated predominantly with their family members and friends who were also the ones that introduced them to online social networking. The benefits of online social networking were: independent and private communication, and reduced isolation. The challenges related to sudden changes in the setup of online social working sites and technical difficulties with equipment. In spite of this, participants' responses indicated that they considered online social networking as a vital way to communicate.

One Australian online site for youth with chronic illness or disabilities (www.livewire.org.au) found that members extensively used the moderated chat forum and formed new friendships online. The site was also deemed socially safe with a high level of peer support (Collin et al. 2011). A 6-month online intervention study in Canada used five trained peer supporters for 22 adolescents with CP or spinal bifida (SB) who felt that the support helped to learn new information, to meet others with disability, and to make new friends (Barnfather et al. 2011; Stewart 2011).
However, there is little if any research that has investigated the effectiveness of individualised training and support provided to young people with disabilities with the aim of increasing their Internet use for social networking purposes. A larger study by the authors investigated the objective and subjective outcomes of interventions to support using Internet social networking for increasing social participation Raghavendra et al (in press). The aims addressed in this paper are:

1) What is the effectiveness of interventions (i.e. providing appropriate technological solutions, training and support) in increasing the use of Internet social networking of young people with disabilities on their online and offline social networks?

2) What is the effectiveness of above interventions to increase the use of Internet social networking of young people with disabilities on their loneliness?

Method

Ethics approval was obtained from the Children, Youth and Women's Health Services Human Research Ethics Committee. The methodology as reported by Raghavendra et al (in press) is outlined in this section.

Design

The authors conducted a larger study using a sequential fixed mixed-methods design (Klassen et al. 2012). The intervention's effectiveness was measured using a pre/post group design where each young person was their own control (Schlosser 2003). Since each young person had individualised goals and tailored training and support strategies, this design was considered the most appropriate. The young person and their parents were interviewed after the intervention. The outcome of the interviews is included in Raghavendra et al (in press) and Grace et al. (2012). However, comments from the participants relevant to the current aim will be included.

Participants

Participants were young people aged 10-18 years with physical disabilities such as CP, MD or other physical conditions, or ABI, and with and without complex communication needs, living in metropolitan Adelaide, South Australia. Those who were at pre-intentional level of communication were excluded from the study. The young person, parent or a professional could indicate the need for the young person to learn to use, or increase their use of, the Internet for social networking. Families needed to have a computer and Internet access at home.

The inclusion criteria were advertised to staff at Novita Children's Services, an organisation providing services to children with physical disabilities from birth to age 18 in the state of South Australia, and in the client newsletter. Staff or parents nominated 123 eligible clients of Novita and invitations to participate were sent to them. Twenty-two consented, but four subsequently withdrew, leaving 18 participating (15% of 123 invited). The demographic information of the young people is presented in Table 1. The mean age was 13.7 years; 66.7% were boys, had cerebral palsy or other physical disabilities, attended high school (from Grade 8 and above) and were in special units within mainstream schools.

The young person's gross motor and hand function was classified based on the Gross Motor Function Classification System (GMFCS, Palisano et al. 2008) and the Manual Ability Classification System (MACS, Eliasson et al. 2006). Communication ability was classified using the new Communication Function Classification System (CFCS, Hidecker et al. 2011) for everyday communication. There are five levels of performance according to the effectiveness of sending and receiving messages with familiar and unfamiliar communication partners. A majority of participants were at Level I of GMFCS, MACS and CFCS, showing that they had minimal physical disabilities and good communication abilities. However, five
with complex communication needs had mild to severe physical disabilities (Level I, IV and V of GMFCS and MACS, and Level III and V on CFCS). Those on Level V on GMFCS and MACS were participants with severe limitations in head, trunk and hand control, requiring extensive assistive technology and total assistance; mobility was only through powered wheelchair. Young people on Level III of the CFCS were effective senders and receivers with familiar partners, where as those on Level V were seldom effective senders and receivers with familiar partners (Hidecker et al. 2011). Even though 78% were on Level I to III on GMFCS, the 22% on Level IV and V had complex communication needs.

<table>
<thead>
<tr>
<th>Gender</th>
<th>N</th>
<th>%</th>
<th>Diagnosis</th>
<th>N</th>
<th>%</th>
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<tr>
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<td>66.7%</td>
<td>ABI</td>
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</tr>
<tr>
<td>Female</td>
<td>6</td>
<td>33.3%</td>
<td>CP</td>
<td>6</td>
<td>33.3%</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Other PD</td>
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| Age (Mean, SD) | 13;7 (2;3) |

<table>
<thead>
<tr>
<th>*GMFCS level</th>
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<th>%</th>
<th>**MACS level</th>
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<th>%</th>
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</tr>
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<td>5</td>
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<td>2</td>
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<td>2</td>
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<td>1</td>
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<tr>
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<td>5.6%</td>
<td>V</td>
<td>1</td>
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</table>

<table>
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<th>Complex Communication Needs</th>
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<td></td>
<td></td>
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<td></td>
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</tr>
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<td>III</td>
<td>4</td>
<td>22.2%</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>IV</td>
<td>1</td>
<td>5.6%</td>
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<td>V</td>
<td>1</td>
<td>5.6%</td>
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</table>

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<tr>
<th>School level</th>
<th>N</th>
<th>%</th>
<th>Class Type</th>
<th>N</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary School</td>
<td>6</td>
<td>33.3%</td>
<td>Mainstream</td>
<td>7</td>
<td>38.9%</td>
</tr>
<tr>
<td>High School</td>
<td>12</td>
<td>66.7%</td>
<td>Special Class</td>
<td>11</td>
<td>61.1%</td>
</tr>
</tbody>
</table>

Table 1 - Demographic information of young people with disabilities.

*Gross Motor Functional Classification System (Palisano et al. 2008)
**Manual Ability Classification System (Eliasson et al. 2006)
***Communication Function Classification System (Hidecker et al. 2011)

Instruments

Social Networks

Social networks can be defined as the framework including all of an individual's social contacts (Gottlieb 1981). Information on social networks was gathered using 'Social Networks: A communication inventory for individuals with complex communication needs and their communication partners', developed by Blackstone & Hunt Berg (2003). This inventory gathers information on communication abilities and about an individual's Circle of Communication Partners (CCPs). This is a visual representation of the individual's social network to identify partners in each circle:

- Circle 1 lifelong communication partners such as family and close relatives
- Circle 2 good friends
- Circle 3 acquaintances such as classmates and neighbours
- Circle 4 paid workers such as teachers, doctors and specialists
- Circle 5 includes unfamiliar partners (e.g., shopkeepers)

The CCPs has been used in previous research as a suitable tool for describing social networks of individuals with disabilities (Raghavendra et al. 2012a; Vickers 2010).

Each young person was shown a diagram of the Circle of Communication Partners. Each circle was explained and examples were provided. The participants were then asked to list all the people they knew and interacted with in each circle. For this study a new Circle 6 was added, focusing on online communication partners, those the participants communicated with either via Facebook, Skype, email and/or online games. The information about online and offline communication partners was gathered before and after intervention.

**Loneliness and Social Dissatisfaction Questionnaire for Children (LSDQC)**

The participants' feelings of loneliness were assessed using the Loneliness and Social Dissatisfaction Questionnaire for Children (Asher et al. 1984). This self-report measure consists of 16 primary items that focus on feelings of loneliness and social dissatisfaction at school (e.g., "I am lonely at school," "I have nobody to talk to in class") and eight filler items that focus on hobbies and interests ("I watch TV a lot", "I like music"). Children indicated how true each item was for them on a scale from 1 (Always true), 2 (True most of the time), 3 (Sometimes True), 4 (Hardly ever true) to 5 (Not true at all). For selected items, the scoring order is reversed. When responses to the 16 primary items are summed up, scores can range from a low of 16 to a high of 80, with higher scores indicating greater feelings of loneliness. The scale has a good reliability (Asher et al. 1984). The tool has been used to examine changes in loneliness following online peer support for young people with physical disabilities (Stewart et al. 2011).

**Procedure**

The research officer administered the Canadian Occupational Performance Measure (COPM, Law et al. 1998), to each young person and their parent together. This identified problems in Internet use, focused particularly around building social networks and social participation. The Circle of Communication Partners responses were noted by asking the participant and/or the parent to list the names of people that the participant communicated with in each circle. The research officer asked prompt questions where necessary to help the young person and their parent to think of and remember various communication partners in the different circles.

For example, " Do you have any uncles, aunts, or cousins? Do you play any sport, music or have hobbies?" If they said Yes, then they were asked who are the people you interact with and when you do those activities. The five participants who used augmentative and alternative communicaton used their sytems to list names of friends and family. Partner-assisted scanning or "Yes/No" questions were also used. The young person's response was circled on the five-point rating scale of the Loneliness and Social Dissatisfaction Questionnaire for Children . Participants were trained in each rating scale prior to use and supported to provide a nonverbal response. The research officer read each item and the five possible responses on the rating scale.

Goals were also developed for between three and five problem areas using the Goal Attainment Scaling (GAS, Kiresuk et al 1968). Examples of goals were:

1) To play games online with others;
2) Arrange to catch up with friends and keep in touch via the Internet;
3) To talk with friends (Circle 2 and 3) online from home;
4) To connect with new people on Livewire.
The intervention consisted of the use of appropriate technologies to overcome perceived problems in Internet access/use, and support and training to use the Internet for the specified goals. The intervention was provided to the young person and/or their parents at their home. It also:

- identified and evaluated the family's computer and Internet access;
- taught the young person and family about cyber safety e.g., use of filtering and privacy settings, development of 'house rules' for expected online behaviour, and explanations/discussion of age-appropriate social media;
- provided software and equipment appropriate to meeting the identified goals such as speech recognition software for text entry, word-prediction software or screen-reading software;
- provided training materials such as visual supports, instructions and hands-on training/practice to use the software, equipment or Internet.

The intervention provided opportunities for the participants to gain knowledge and skills in a safe and supported context appropriate to their age and abilities. It also enabled parents to provide support and manage problems in-between home visits. Training was framed to ensure that participants would access the websites identified in their goals in order to engage in social networking with their peers, friends, families and others as necessary. Individual support was provided by the research officer (EG) - a speech pathologist with extensive clinical experience with young people with disabilities and a research background. A research assistant carried out parts of the intervention programme.

At the end of the intervention period, the social networks and the loneliness measures were re-administered.

**Results**

Since the intervention was individualised for the young people and one-on-one and intensive, a mean number of 11 home visits per young person (SD=3.61) was made over an average of 6.8 months (SD=2.66), with each visit lasting an average 75 minutes (SD=12.34). Since it was home-based, the intervention required travel time and additional work such as ordering specific technology and preparing tailored training materials.

The 18 young people and parents identified a total of 55 problem areas (range 1-5; mean = 3.05). The majority of problem areas identified (37 out of 55, 67%) related to a lack of knowledge and skills around the use of various online social networking (e.g., games, Skype, Facebook, Twitter, videos, email, Livewire). The young people were unaware of strategies for, and lacked opportunities for, socialising. Other problem areas identified (18 out of 55, 33%) related to difficulties with access to the Internet and computer and not being able to independently use the Internet for social networking (e.g., physical access, connection to the Internet, literacy, cyber safety).

**Social Networks**

Figure 1 shows the mean number of circles of communication partners for Circle 1 to Circle 4 and Circle 6. The participants found it difficult to list the number of unfamiliar partners in Circle 5 such as shop-keepers, waiters and others, but were able to list them in groups. Hence, the mean number could not be calculated. The Circles 1 to Circle 4 partners; there does not appear to be variation between before and after the intervention. The standard deviations for mean number of Circle 3 CCPs (friends and acquaintances) before and after intervention were higher indicating variation among the group. The Wilcoxon Signed Ranks test showed that there was no significant difference between before and after the intervention in the CCPs (Circle 1, \( p = .655 \); Circle 2, \( p = .195 \); Circle 3, \( p = .900 \); Circle 4, \( p = .501 \)).
The online communication partners were individuals that the young people communicated with via Facebook, Email, Skype, Instant messaging, blogs, etc. The communication partners could be from other Circles or just Circle 6. The baseline and post-intervention Circle 6 data from 2 participants were removed as they were considered to be outliers with very high number of CCPs. One participant had 196 “friends” on Facebook at baseline and also communicated on Skype with 10 individuals from other Circles; for another participant Circle 6 baseline data was not recorded through an omission and post-intervention data showed that they had 989 friends on Facebook. Figure 1 shows the mean number of Circle 6 data for the 16 young people before the intervention (M=4.31, SD=10.66) and after the intervention (M=26.18, SD=43.08). The standard deviations are higher indicating high variability within the data.

Figure 2 shows the Circle 6 data for each of the 16 participants in increasing order. Eleven of the 16 did not communicate with anyone online before the intervention and the other five participants had a range from one to 38 communication partners. However, after the intervention, all had online communication partners varying from four to 170. Participant O who previously had zero online communication partners had 78 “friends” on Facebook at the end of the project. The Wilcoxon Signed Ranks test showed that this difference was significant (p=.000).
Figure 2 - Online Communication Partners (Circle 6) before and after intervention.

Loneliness Measure

Figure 3 shows the mean score for the 18 young people on the Loneliness and Social Dissatisfaction Questionnaire before and after the intervention. The mean scores reduced from 34.44 (SD 9.2) to 31.05 (SD 8.7). For five participants with complex communication needs the baseline mean loneliness score was 40.6 (SD 7.4) and after intervention this decreased to a mean score of 32.8 (SD 10.4).
Figure 3 - Mean total raw score on Loneliness and Social Dissatisfaction Questionnaire before and after intervention.

Change in mean ratings for each item on the LSDQC before and after intervention are reported in the Table 2 below. Out of the 16 items that measure loneliness and social dissatisfaction, on 12 items, the mean ratings decreased, indicating that there was a decrease in reported loneliness. On four items, the mean ratings increased, indicating that there was an increase in measure of loneliness. The Paired T-test showed that this difference was not statistically significant (t (17) 1.531, p = .144).
Table 2 - Change in mean response on loneliness items before and after intervention and reflected changes in loneliness and social dissatisfaction.

<table>
<thead>
<tr>
<th>Mean Rating of items on Asher Scale</th>
<th>Change in mean rating on Asher scale</th>
<th>Change in Loneliness</th>
</tr>
</thead>
<tbody>
<tr>
<td>I don't have anyone to play with.</td>
<td>-0.67</td>
<td>decrease</td>
</tr>
<tr>
<td>It's hard to get other kids to like me.</td>
<td>-0.55</td>
<td>decrease</td>
</tr>
<tr>
<td>There's nobody I can go to when I need help.</td>
<td>-0.55</td>
<td>decrease</td>
</tr>
<tr>
<td>I don't get along with other children.</td>
<td>-0.44</td>
<td>decrease</td>
</tr>
<tr>
<td>I have nobody to talk to.</td>
<td>-0.39</td>
<td>decrease</td>
</tr>
<tr>
<td>I am well-liked by the kids in my class.</td>
<td>-0.39</td>
<td>decrease</td>
</tr>
<tr>
<td>I don't have any friends.</td>
<td>-0.39</td>
<td>decrease</td>
</tr>
<tr>
<td>I feel left out of things.</td>
<td>-0.34</td>
<td>decrease</td>
</tr>
<tr>
<td>I have lots of friends.</td>
<td>-0.11</td>
<td>decrease</td>
</tr>
<tr>
<td>It's hard for me to make friends.</td>
<td>-0.11</td>
<td>decrease</td>
</tr>
<tr>
<td>I can find a friend when I need one.</td>
<td>-0.06</td>
<td>decrease</td>
</tr>
<tr>
<td>I'm lonely.</td>
<td>-0.05</td>
<td>decrease</td>
</tr>
<tr>
<td>It's easy for me to make new friends at school.</td>
<td>0.11</td>
<td>increase</td>
</tr>
<tr>
<td>I'm good at working with other children.</td>
<td>0.11</td>
<td>increase</td>
</tr>
<tr>
<td>I feel alone.</td>
<td>0.11</td>
<td>increase</td>
</tr>
<tr>
<td>I get along with other kids.</td>
<td>0.33</td>
<td>increase</td>
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</tbody>
</table>

Mean Rating of items on Asher Scale

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<thead>
<tr>
<th>Change in Loneliness</th>
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</thead>
<tbody>
<tr>
<td>decrease</td>
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A case example illustrates the outcomes of the study. Kate (pseudo name) is a girl aged 16 years 9 months with Spinal Muscular Atrophy (SMA). She is on Level IV on GMFCS, level III on MACS and Level 1 on CFCS. She used a powered wheelchair well and speech and writing for everyday communication. In the initial interview using the COPM she indicated that she wanted to get a connection to the Internet and to be able to socialise online at times that suited her. She did not have access to a computer or Internet independently as she lived away from home due to complex health and family reasons. She was provided with an iPad and Internet connection for 3 months. She was supported to download and use applications such as Safari, Facebook, IMO (instant messaging), and Mail (email) on the iPad to monitor and recharge her Internet account. The training and support required 11 visits with one-to-one support over a period of six months. Kate learned to use Facebook independently and learned to recharge her own Internet.

After the intervention, she reported that she was able to socialise with more people, talked more and was more confident when talking with people on Facebook. She made several new online "friends" who were "friends of her friends" and with whom she felt safe socialising online. She was also able to connect with more people outside of school time and her family whom she had previously been unable to contact by phone. She used Facebook prior to the intervention with the support of others to help her get a connection, but following the intervention was able to use the Internet independently at a time and place that suited her. Her online friends increased from 38 to 159 after the intervention. Kate said:

...because when I've got the iPad I say more things than I do in person because I'm more confident meeting people on Facebook. I made lots of new friends and they're all like friendly and we have good chats.

I'm usually a very shy person but when I'm on Facebook I'm not as shy, I just type. I say more things when I'm on Facebook than I do face to face because I was shy.

They think I'm really cool and nice.

Her score on the Loneliness and Social Dissatisfaction questionnaire showed a slight increase in loneliness from 30 before to 33 following intervention, however, her score is an indication of low loneliness according to the authors (Asher et al. 1984). On the item, "There's nobody I
can go to when I need help," she rated it as "Always true" at baseline and "Hardly ever true" after intervention. For most of the items her ratings were overall positive.

**Discussion**

The results identified positive benefits of the tailored personal intervention to support personal goal attainment in terms of increasing the number of online social communication partners. These were predominantly with existing offline friends and family, but also included new connections made online. In order to measure these networks using the Circle of Communication Partners, we added a new category – Circle 6 'Online communication partners'.

The increase in Circle 6 online communication partners has to be interpreted with caution as there was high variability within before and after intervention data. For the majority of participants there was a floor effect with no online partners before the intervention. For a few of the participants, after the intervention, the predominant online connection was through Facebook. They communicated with offline or familiar partners from Circle 1 to Circle 4. Two participants had both offline and new online partners through Facebook and Livewire. Few of the participants used only Skype, email or blogging to communicate and this was only with people from Circle 1 to Circle 4. Participants with the lowest numbers of online communication partners after intervention had complex communication needs, poor literacy skills or limited family support. Online communication partners reported by these participants post intervention were predominantly from circle 1 (lifelong communication partners) and circle 4 (paid communication partners).

The post-intervention interview showed that the participants and families were highly satisfied with individualised support and training provided at home (Grace et al. 2012; Raghavendra et al. (in press)). As highlighted by Rhem (2011) this approach provides parents with a possible strategy to promote the development of social networks for young people with disabilities.

The Loneliness measure showed that overall the group was not "very lonely" at baseline according to the developers of the tool (Asher et al. 1984). However the subgroup of participants with complex communication needs had a higher baseline mean loneliness score than the overall group. The overall post-intervention score showed decrease in scores in the right direction, however this was not statistically significant. The mean loneliness scores from this study are similar to score reported in an online peer mentoring intervention study by Stewart et al (2011) who also did not find a significant difference in loneliness measures.

Overall, the increased number of connections in the new Circle of Online Communication Partners did not translate into statistically significant reductions in loneliness measures for this group. This may be explained by the fact that this group mainly connected online with people they already knew offline, and that this interaction was no different to the quality of social connection with these same people offline and so had no overall effect on reducing measures of loneliness. However, out of the total 16 items, 12 reduced in their mean rating. This suggests that the training in online Internet use for social networking purposes may have some impact on some aspects of loneliness in terms of feelings of being connected. It is important to note that the participant group reported generally low levels of loneliness pre-intervention, and majority had minimal physical disabilities and good communication levels. This suggests that it would be good to research the impact on social communication levels and loneliness by targeted recruitment to such an intervention among a group with known higher levels of disability and lower levels of communication and existing friendship networks (such young people may be among those who declined to participate in our study). This research identified that some participants 'collected' a significant number of 'friends' on Facebook. However, this did not appear to translate into any significant difference overall in the level of loneliness reported. Nevertheless, the comment by the one participant suggests that, for some young people, making friends on Facebook could reduce their levels of loneliness and increase their sense of connection.
'Loneliness' may be quite subjective, not always directly related to level of objective social activity (online or otherwise). For example, it is not unknown for very socially active people to describe themselves as lonely, or the reverse. Another issue is the stability of such a perception, whether it fluctuates within brief periods (e.g., over a week). Personality variables (e.g., level of introversion/extroversion, mood or anxiety) and cultural factors (e.g., the value placed on 'popularity') could conceivably influence this. Given the importance of relationships to mental health and quality of life, pursuing an in-depth understanding of loneliness is very worthwhile. More complex factors could be at play in producing these results. Future research could explore the above issues. Research also needs to investigate the impact on social connection and the meaning of 'friends' on Facebook to young people with disabilities who have small friendship networks offline.

**Conclusion**

The average young person today uses the Internet regularly for social networking. Since young people with disabilities have fewer friends and reduced social networks offline, the Internet holds the potential to be a new way for these young people to extend their social connections. Our research with 18 young people with physical disabilities or acquired brain injury demonstrated that a tailored programme of assistive technology and training in the home significantly increases the number of online communication partners. While this did not in turn reduce measured levels of loneliness overall, it did reduce the level of loneliness associated with 4 individual items on the loneliness scale.

We recommend that future research of this kind be undertaken with a larger number of participants with disabilities, particularly encouraging participation from those with varying initial levels of social connection, and measures of loneliness. We also recommend augmentation with qualitative research to identify the meaning and role of the number and type of online social connections for young people with disabilities, and the contribution these can make to enhancing wellbeing in this group. This will help to identify the extent to which online social networking can be used as a strategy to reduce loneliness and isolation for young people with a physical disability.

**Acknowledgement**

The authors wish to thank the young people with disabilities and their families for their commitment and participation. Thanks are extended to Renee Jose, Research Assistant and Adam May, IT consultant at Novita Children’s Services for their valuable contributions. This study was funded by the Channel 7 Children’s Research Foundation of South Australia.

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Deaf people’s experiences, attitudes and requirements of contextual subtitles
A two-country survey

Marion Hersh
University of Glasgow

Subtitles are text versions of the speech content of television and other audiovisual media. The paper discusses the results of a survey of deaf people in Poland and the UK on their experiences of, attitudes to and requirements for subtitles, including for the representation of emotions and contextual features. The results demonstrated the importance of subtitles, and that they considerably improved comprehension for the great majority of respondents. The overwhelming majority preferred verbatim subtitles, but attitudes to other suggested features were very varied, indicating the need for subtitle personalisation. This has not been considered previously and would now be feasible due to advances in technology.

Introduction

This paper presents the results of a survey of deaf people in the UK and Poland about their experiences of, attitudes to and requirements for subtitles, including for the representation of emotions and contextual features. The methodology, results and conclusions of this survey are presented in Sections 2, 3 and 4 respectively. It is introduced by a brief overview of the literature in the remainder of this section.

Subtitles are verbatim or edited (and sometimes simplified) text versions of the speech content of a television programme or other audiovisual presentation. Closed or soft subtitles (called captions in the USA) are used to make audiovisual media accessible to deaf people, whereas the subtitles used to make foreign language materials accessible to both hearing and deaf people are generally open. Closed subtitles are presented as separate instructions from the programme and can therefore be personalised or omitted, whereas open or hard subtitles are an integral part of the video frames and cannot be turned off or personalised (Anon 2012a). Closed subtitles can be produced either online or offline, whereas open subtitles are always produced offline.

In offline subtitling the subtitle file is prepared in advance and automatically cued into the programme using a timecode in the programme master tape or the subtitles may be encoded in the video signal. This allows the text to be checked and errors to be corrected and careful synchronisation of the text and speech. Online subtitles are used when there is insufficient time to prepare a subtitle file. They include realtime or live subtitling, in which a realtime stenographer uses a computer to transcribe stenographic input for nearly immediate presentation, and pre-prepared subtitles, which are prepared in advance and input using live manual cueing when the programme is transmitted. Speech recognition technology with revoicing (as speech recognition software is designed for use with a single voice) is frequently used in live captioning in the UK (Anon 2012a).
The high rate of subtitling by the two main UK broadcasting companies at over 97.5% and 88% by the BBC and IT respectively (EFHOH 2011) and the over 1.5 million deaf subtitle users in the UK (Ofcom 2007) illustrate the importance of subtitling for deaf people. A small-scale survey of older deaf people (59-82 years old) found that the use of closed subtitles significantly increased their understanding of three different types of television programmes (Gordon-Salant & Callahan 2009).

Early subtitles in Europe and the USA were transmitted at 120-125 words per minute, two thirds the rate of speech, and in simplified language, based on assumptions about the needs of prelingually deaf people (Jensema & Burch 1999), (Schilperoord et al. 2005). However, great care is required to ensure that editing and simplification do not change the meaning and facilitate rather than reduce understanding (Power & Leigh 2000), (Schilperood et al. 2005). Feedback from deaf viewers in both Europe and the USA has indicated a preference for verbatim subtitling (Jensema & Burch 1999), (Schilperoord et al. 2005). In many European countries subtitles comprise two lines of text (64 characters) which are displayed for a maximum of six seconds, giving 120 words per minute. Studies of subtitle reading rates with relatively large numbers of deaf and hearing people have obtained a most ‘comfortable’ reading speed of about 145 words per minute (Jensema et al. 1996), (Jensema 1998) and recommendations of not more than 180 words a minute (Ofcom 2005) and found (Braverman & Herzog 1980), (Tyler et al. 2009) no benefits in reducing subtitling speeds for children to 90 words a minute, despite recommendations of 60 words (Baker 1985). Many countries have converted from analogue to digital television, are in the process of doing so or plan to do so in the next ten years (Anon 2012b).

Deaf people have criticised existing subtitling systems, largely on account of poor legibility and the lack of contextual features, including emotion in dialogue and background music, music tempo, mode or depth, non-speech items, speaker identification and the timing of jokes and puns (Bokšan-Cullen 2012), (Fourney & Fels 2008), (Lee et al. 2007), and appreciated the use of cues to indicate sarcasm, pauses and background noises (Ofcom 2005). The factors that reduce legibility include blur, inappropriate or poor formatting, poor colour contrast, spelling mistakes, poor synchronisation of the speech and text and too high a transmission rate (Bokšan-Cullen 2012), (ITC 1999), (Karamitroglou 1998), (Ofcom 2005), (Thorn & Thorn 1996). Good synchronisation is important as many deaf people lip-read and the synchronised subtitles and speech work together to aid comprehension, rather than the subtitles being the only source of information. High transmission rates may be a particular problem for older deaf people with reduced rates of information processing and/or visual impairments (Thorn & Thorn 1996).

Representing Emotions and Contextual Features

Existing subtitle systems increasingly provide information about background sounds, but rarely full contextual information, for instance that there is background music, but not its mood and other characteristics (Karamitroglou 2002), the texts of songs or the emotion in speech (Hersh et al. 2010), (Lee et al. 2007). Sound is important in conveying emotion in films, leading to the possibility of the misinterpretation of subtitles when this information is absent (Shilling et al. 2002). Most of the limited research on representing emotions in subtitles has been carried out by two very loosely defined groups, based in Canada (Fels et al. 2005), (Lee et al. 2002), (Lee et al. 2007), (Rashid 2008), (Rashid et al. 2006), (Rashid et al. 2008), (Silverman and Fels 2002), (Vy et al. 2008) and the UK (Hersh et al. 2009), (Hersh et al. 2010), (Ohene-Djan & Shipsey 2006), (Ohene-Djan et al. 2007).

Several approaches have been implemented on a trial basis in short audiovisual sequences to obtain feedback from deaf and sometimes also hearing people. Ohene-Djan et al. (2007) identified speakers by the use of different colours and represented emotions by different types of fonts and loudness by font size. Rashid and colleagues (Rashid 2008), (Rashid et al. 2006), (Rashid et al. 2008) have developed a framework relating seven animated text properties, including text size, duration and ‘shaking’, to four basic emotions, though others could be
added. Larger text, faster movement and faster onset were used to indicate a stronger effect. Small-scale tests found that deaf and hearing people preferred the text to be in the standard location at the bottom of the screen and the version without strong shaking movements. Correct recognition of emotions was slightly, but not statistically significantly, greater for standard than animated subtitles (Rashid 2008).

Comic book conventions, including speech bubbles, colour, text styles, animation and icons, have been used to represent eight basic emotions and various speech features and identify speakers (Silverman and Fels 2002), (Fels et al. 2001). Positive feedback was obtained from a small number of viewers watching a short video clip, though several noted that they associated these conventions with children. A related approach (Fels et al. 2005), (Lee et al. 2007) used graphics and a coloured border round subtitle phrases to represent eight emotions and their intensity, and icons for music and sound effects. Small numbers of hard of hearing participants watching a short video clip liked the coloured captions, but Deaf participants did not, though age may also have affected preferences. Both groups did not like the moving captions, found they sometimes interfered with actors’ faces and preferred knowing where the subtitles were than having to look for them. Other suggestions include the use of atmospheric pictures and photos of the faces of Deaf signers (Hersh et al. 2009, 2010).

A very different approach involves vibro-tactile stimuli conveyed via a footrest with two vibrators and two variable speed fans for each foot (Degan & Fels 2001). Foot stimulation was chosen to keep the hands free, but could raise social acceptability issues. Tactile pattern, frequency and signal strength were used to represent four emotions, with parameter values based on guesstimates. Small-scale tests found that participants had difficulty in recognising the different emotions.

Subtitling tools have been developed to support the use of additional features to indicate emotions and the context. The emotional subtitle editor (Ohene-Djan et al. 2007) allows the subtitle font, colour and/or text size to be formatted according to predefined schemes. The CapScribe tool (Boyce et al. 2012) provides support for adding text styles and a second video window, which could provide sign language interpretation, additional graphics or animated features. The rendering engine tool (Fels et al. 2005) automatically creates graphical pop-on cartoons using pre-designed image files associated with the different emotions. EmACT (Vy et al. 2008) can add text animation, style, formatting, colour and location.

Methodology

A survey of deaf people and their experiences, attitudes to and requirements of subtitles was carried out using a six-section questionnaire with a mixture of quantitative and qualitative questions. Both English and Polish versions of the questionnaire were produced. The following information was sought:

- **Section A**: gender, age, education, employment, language (sign or spoken), ease of communication and reading.
- **Section B**: frequency of viewing and the availability and quality of television, DVD, video and cinema subtitles.
- **Section C**: ease of reading and understanding subtitles, whether they improve understanding and are displayed for long enough, and preferences for verbatim or edited subtitles.
- **Section D**: interest in additional information, including about speakers’ emotions, features of speech, the text of songs, sounds and the atmosphere.
- **Section E**: evaluation of specific proposals for representing this additional information.
- **Section F**: the use of subtitles in educational programmes and lectures.

Methodologies for surveying deaf and other groups of disabled people are incomplete and there is not yet an accepted best procedure (Hersh 2010), (Hersh 2011). The smaller numbers and the fact that readily accessible public lists very rightly do not indicate disability status make this more complicated than surveying the general population. The questionnaire was
sent to a large number of organisations and personal contacts, who circulated the questionnaire to other individuals and organisations, and posted on my website. Information about the questionnaire was posted on several lists. When quoting comments from Polish respondents, I have tried to keep the translation close to the style of the original. Statistical significance at the 0.05 level was determined using Kirkman’s (1996) software for a contingency table χ² test with five degrees of freedom or four in the case of zeros across a row.

**Results**

The survey received 83 useable responses, though not all respondents answered all the questions. The calculated percentages for each response are based on the number of respondents for the question not the total. The respondents were approximately gender balanced, fairly evenly split between Poland and the UK and had a reasonable age distribution though the 26-40 age group was underrepresented (see Table 1). Both “signers” and ‘speakers’ and users of both sign and spoken language were represented, though the percentage of signers was higher than in the deaf population. There was an approximately even division between respondents with secondary, vocational or further, and higher education and a few respondents with only primary education. The largest occupational group was retired (typical of the increase in deafness with age), followed by students, with just under a quarter employed full or part time and the remainder unemployed, on a disability pension or looking for a job.

It is difficult to totally avoid respondent bias in this type of sampling. However respondents were sufficiently varied on the main demographic variables to be representative of the various perspectives in the deaf community and there was no obvious direction of bias, making it unlikely there would be significant bias.

<table>
<thead>
<tr>
<th>Gender (%)</th>
<th>Age Profile (%)</th>
<th>Country (%)</th>
<th>Language (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Female 49.4</td>
<td>Male 50.6</td>
<td>16-25 31.3</td>
<td>26-40 8.4</td>
</tr>
</tbody>
</table>

Table 1 - Respondent characteristics.

**Viewing Behaviour and Interest in Subtitles**

Watching television and DVDs or videos were important activities for the respondents with just over half of them watching TV for several hours a day and four fifths at least once a week, just over a quarter watching DVD or videos several times a week and 40% at least once a month. Respondents visited the cinema relatively infrequently, with only just over a third going at least once a month. One respondent who did not go to the cinema considered it “too loud” and this exacerbated their tinnitus.

Although not all the respondents used subtitles, they were a (very) important component of viewing for the majority of them (see Table 2), with over a third only watching subtitled TV programmes, just over half only or mainly watching subtitled programmes and another 28.6% preferring subtitled programmes, but willing to watch others. The figures were similar for DVDs and videos. When subtitles were available only for some screenings of a good cinema film, nearly a quarter would only watch with subtitles and over another third would watch the subtitled version if the time was convenient. Nearly a fifth would not see the film and could be considered to have been prevented from doing so by the lack of subtitles. In all three cases only about a fifth considered the presence of subtitles unimportant.
Watching with subtitles

<table>
<thead>
<tr>
<th></th>
<th>TV</th>
<th>DVD or Video</th>
<th>Limited cinema subtitling</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Only subtitled programmes</td>
<td>35.1%</td>
<td>32.0%</td>
<td>Go when subtitles on</td>
<td>24.6%</td>
</tr>
<tr>
<td>Mainly subtitled programmes</td>
<td>15.6%</td>
<td>24.0%</td>
<td>See with subtitles if time convenient</td>
<td>36.9%</td>
</tr>
<tr>
<td>Prefer subtitles, will watch others</td>
<td>28.6%</td>
<td>26.0%</td>
<td>Watch unsubtitled film</td>
<td>20.0%</td>
</tr>
<tr>
<td>Unimportant whether subtitles</td>
<td>20.8%</td>
<td>18.0%</td>
<td>Not see film</td>
<td>18.5%</td>
</tr>
<tr>
<td>Response rate</td>
<td>92.8%</td>
<td>60.2%</td>
<td>Response rate</td>
<td>78.3%</td>
</tr>
</tbody>
</table>

Table 2 - Watching with subtitles.

Despite the commitment of the major UK TV broadcasting companies to subtitling, over a quarter and over 60% respectively of the respondents considered that a lot and at least some interesting programmes lacked subtitles (see table 3), though UK respondents noted the ‘good coverage’. The figures for DVDs were similar, but slightly better. In both cases only about 15% of respondents considered that no interesting programmes lacked subtitles.

Programmes lacking subtitles

<table>
<thead>
<tr>
<th></th>
<th>TV</th>
<th>DVD or Video</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>A lot</td>
<td>26.3%</td>
<td>20.5%</td>
<td></td>
</tr>
<tr>
<td>Some</td>
<td>34.2%</td>
<td>31.5%</td>
<td></td>
</tr>
<tr>
<td>A few</td>
<td>21.1%</td>
<td>26.0%</td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>14.5%</td>
<td>15.1%</td>
<td></td>
</tr>
<tr>
<td>Unsure</td>
<td>3.9%</td>
<td>6.8%</td>
<td></td>
</tr>
<tr>
<td>Response rate</td>
<td>91.6%</td>
<td>88.0%</td>
<td></td>
</tr>
</tbody>
</table>

Table 3 - Programmes which lack subtitles.

Of the respondents, 39 commented on the quality of TV, 30 on DVD subtitles and 31 on cinema subtitles. In line with the preference for offline (pre-recorded) TV subtitles, most comments considered them ‘generally good’ or even ‘usually excellent’, ‘unless transmission … delayed and then they often bear little relationship to what is on screen. That … is almost worse than useless.’ Worryingly, the quality of live subtitles was considered ‘not good enough’, ‘absolutely appalling’, and ‘too inaccurate and slow to enjoy watching’ with ‘too many misspelt words’. The introduction of revoicing to correct mistakes was considered to have made the situation worse. This may be due to analogous contextual features to those that make speech recognition less accurate in a class than an office (Wald 2006) and requires further investigation.

DVD subtitles were ‘generally quite good’ or ‘excellent’, though they were not ‘descriptive like on TV’, missed ‘things such as “door bangs outside” that help understand the ambience’ and ‘very often the extras are not subtitled’. ‘DVDs without subtitles are generally old films often classics’, but ‘programmes broadcast with subtitles do not always have them on the DVD’. Many respondents were only interested in DVDs with subtitles and particularly irritated by ‘the fact that many online sellers neglect to tell you whether or not the DVD has subtitles’. Several Polish respondents appreciated the ability to ‘stop’ the DVD to finish reading the subtitle if necessary and considered cinema subtitles ‘too fast’. However, the main issue for cinema subtitles was availability rather than quality. One respondent noted that ‘the subtitles do not work … five out of the six last times we have been’ and another that cinema staff have to be ‘remind[ed] … to turn them on’. Respondents also noted legibility problems, including ‘light colour text … lost on a light coloured background’, ‘sometimes a line is missing’, or the subtitles being ‘out of ‘tune’ with the dialogue’ i.e. not properly synchronised.
Subtitles made a significant difference to respondents’ experiences of watching TV, DVDs and cinema films (Table 4), with nearly 60% and over 80% respectively understanding programmes a lot better and better with subtitles. This is paralleled by the just under 70% of respondents who were able to understand all or most of the text and the over 70% who found them (very) easy to read and considered that they were displayed for sufficient time to read and understand most of the text. However, about 10% of respondents found them (very) difficult to read and displayed for insufficient time, paralleling the 11% who found reading (very) difficult. Over 20% only understood about half and 5% very little of the text.

<table>
<thead>
<tr>
<th>Understanding better with subtitles</th>
<th>Ease of reading subtitles</th>
<th>How much of subtitles understand</th>
</tr>
</thead>
<tbody>
<tr>
<td>A lot better</td>
<td>Very easy</td>
<td>Whole text</td>
</tr>
<tr>
<td>Better</td>
<td>Easy</td>
<td>Most of text</td>
</tr>
<tr>
<td>About the same</td>
<td>Neither easy nor difficult</td>
<td>About half</td>
</tr>
<tr>
<td>Not sure</td>
<td>Difficult</td>
<td>Very little</td>
</tr>
<tr>
<td></td>
<td>Very difficult</td>
<td>Depends</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unsure</td>
</tr>
<tr>
<td>Response rate</td>
<td>Response rate</td>
<td>Response rate</td>
</tr>
</tbody>
</table>

Table 4 - Understanding and ease of reading of subtitles.

The majority of respondents wanted verbatim subtitles (see Table 5), with nearly 60% always wanting verbatim subtitles and nearly 80% wanting verbatim subtitles either always or unless they would be very complicated. They considered it ‘very patronising’ when ‘things are made simpler’, wanted to be on an ‘equal footing [with] hearing people’ or ‘to get to know the character’ and what ‘the use of the words show’ about them. The problems lip-reading if ‘what I am reading does not appear to match up with what they are saying’ were also noted. Some respondents were ‘happy to have a shortened version – less tiring’ if what was being said was not ‘very important’, but wanted to ‘see it all’ if ‘important to the subject matter’. Respondents who wanted a shorter version recognised that they were ‘not able to understand the text’ or needed ‘time to both read the subtitles and see what was on the screen’. The approximately 9% wanting a shorter version was compatible with the 10% finding subtitles (very) difficult to read and the time too short. However, 30% wanted longer to read the subtitles, which is closer to the 25% who found the time sufficient to understand very little or at most about half of the text.

<table>
<thead>
<tr>
<th>Sufficiency of available time</th>
<th>Preference for verbatim or edited subtitles</th>
<th>Want additional time to read subtitle text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Read and understand all text</td>
<td>Verbatim always</td>
<td>Yes, always</td>
</tr>
<tr>
<td>Read most text, understand sense</td>
<td>Verbatim, unless very complicated</td>
<td>Yes, unless miss part of speech</td>
</tr>
<tr>
<td>Sometimes understand sense</td>
<td>Shorter version</td>
<td>No</td>
</tr>
<tr>
<td>Often insufficient and not understand</td>
<td>Unsure</td>
<td>Unsue</td>
</tr>
<tr>
<td>Response rate</td>
<td>Response rate</td>
<td>Response rate</td>
</tr>
</tbody>
</table>

Table 5 - Sufficiency of time to read subtitles and preference for verbatim or edited version.
Interest in Contextual Features and Emotions and their Representation

Respondents were considerably more interested in subtitles showing information about the main and other characters’ feelings than the atmosphere or the loudness or speed of their speech, and these were the only features a majority (over 60% and over 50% respectively) of the respondents considered information about (very) important (table 6). Slightly under half and about 40% considered information about the atmosphere and loudness of the main characters respectively (very) important. The 26 comments about information about emotions and 22 about the atmosphere expressed various perspectives.

Some respondents were interested in this information, as ‘Normal heard speech is full of emotion, it conveys feelings that are lost when presented with the written word’ and ‘Tone of voice conveys a lot of information. A lot of jokes rely on other characters’ reactions’.

Others felt it was already available to them, as ‘emotions can usually be judged from the appearance of the character, comment in subtitles not really needed’ and ‘as a deafened person I am used to reading body language and how the speaker feels’, should be obvious from their demeanour’ or ‘indifferent’.

Other respondents felt it ‘depends on the context’, wanted to know about ‘whispers/shouts/mumbles’ or felt that ‘emotions of speakers in vision should be obvious’ and that information was only needed for ‘speakers off screen’.

A number of respondents found that ‘stupid background’ or ‘that LOUD + GHASTLY AWFUL’ music interfered with ‘what little I can hear’. ‘TURN IT OFF.’ (their capitalisation). Others wanted ‘anything that the music or sound conveys to hearing people that deaf people would miss’, ‘something simple such as “scream in the distance”’ or considered that ‘you get the atmosphere through the subtitle’ or ‘only if it isn’t obvious’. ‘A more systematic set of symbol representations for ‘atmosphere so I could learn what to expect’ was suggested, with concerns about the use of ‘♩♩♩’ for ‘all the types of background music, but no indications saying “scary” “romantic”, “comic”, etc.’. Concern was also expressed that it was not possible ‘to translate background music into words that will convey atmosphere. … To say “scary music” or “romantic music” does not convey anything remotely like the emotional impact such music has on the human mind.’ The 19 comments about information on speakers’ loudness, speed and other features expressed interest in information about accents, tone of voice and a ‘clearer indication of who is speaking, especially when there are lots of characters’, with the suggestion of a combination of colour coding and the name of the speaker.
<table>
<thead>
<tr>
<th>Feature</th>
<th>Very important</th>
<th>Important</th>
<th>Indifferent</th>
<th>Not want</th>
<th>Really not want</th>
<th>Unsure</th>
<th>Response Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feelings of main characters</td>
<td>26.0%</td>
<td>35.1%</td>
<td>22.1%</td>
<td>10.4%</td>
<td>3.9%</td>
<td>2.6%</td>
<td>92.8%</td>
</tr>
<tr>
<td>Feelings of other characters</td>
<td>18.2%</td>
<td>35.1%</td>
<td>27.3%</td>
<td>9.1%</td>
<td>6.5%</td>
<td>3.9%</td>
<td>92.8%</td>
</tr>
<tr>
<td>Atmosphere</td>
<td>12.3%</td>
<td>37.0%</td>
<td>28.8%</td>
<td>11.0%</td>
<td>6.8%</td>
<td>4.1%</td>
<td>88.0%</td>
</tr>
<tr>
<td>Loudness of main characters</td>
<td>16.9%</td>
<td>23.4%</td>
<td>44.2%</td>
<td>9.1%</td>
<td>5.2%</td>
<td>1.3%</td>
<td>92.8%</td>
</tr>
<tr>
<td>Loudness of other characters</td>
<td>15.1%</td>
<td>17.8%</td>
<td>38.4%</td>
<td>17.8%</td>
<td>8.2%</td>
<td>2.7%</td>
<td>88.0%</td>
</tr>
<tr>
<td>Speed of speech of main characters</td>
<td>21.6%</td>
<td>10.8%</td>
<td>40.5%</td>
<td>10.8%</td>
<td>8.1%</td>
<td>8.1%</td>
<td>89.2%</td>
</tr>
<tr>
<td>Speed of speech of other characters</td>
<td>13.5%</td>
<td>16.2%</td>
<td>39.2%</td>
<td>17.6%</td>
<td>9.5%</td>
<td>4.1%</td>
<td>89.2%</td>
</tr>
</tbody>
</table>

Table 6 - Importance of information about particular features of speech and the atmosphere.

Respondents were equally divided between those who did not want additional information in the form of a small picture and those who would like a picture under some circumstances, for instance if easy to understand or together with text. Nearly two thirds preferred text descriptions for background sounds over small pictures of the sounds, though a third wanted either small images or a combination of images and text. Some 23 respondents commented about the types and 14 about the details of background sounds they were interested in. Many of the comments were on the lines of ‘only if important’, ‘relevant’, ‘essential to understanding the plot’ or ‘out of view’. Other respondents suggested particular types of sounds, such as dogs barking, door bells, phones, ‘mumbling hms, ahhs, radio chatter, animal noises, clocks ticking’. Respondents were interested in the text of songs, with well over a third wanting the text of all songs, even in the background, and another quarter wanting those that were part of the scene. Only just under a fifth did not want the text of any songs.

Attitudes to the different suggested representations of the atmosphere, emotions and features of speech were very varied (See Table 7). The highest mean score (maximum value 5) was 3.1, while several scores were under 2 and response rates ranged from 7 to 53%, indicating a lack of enthusiasm for all the representations. However, a significant minority of respondents were very interested in several of the options, as shown by the relatively high number of respondents with scores of 4 and over.

The aim of the graphical representations was to produce the same type of emotional and visceral reaction as occurs to atmospheric music and, to a lesser extent, strong emotions in speech. However, the highest scores were obtained for short text descriptions for the atmosphere and emotions and modifications of the text format (letter size in all cases, bold or italic for atmosphere and features of speech, different fonts for features of speech and colour for atmosphere), rather than graphical representations. Signers had higher preferences than speakers for graphical representations, in particular, atmospheric images (2.9 cf. 1.7) and atmospheric photos (3.6 cf. 2.0) and for different colours for the atmosphere, but the difference was only statistically significant for atmospheric photos (p=0.05). Unsurprisingly signers had considerably higher preferences for photos of signing hands (3.4 cf. 0.8), a combination of photos of signing hands, colour, size and font (3.5 cf. 1.0) for representing features of speech, with both differences statistically significant (p=0.000 and p=0.010 respectively), but their higher preferences for colours and font were not statistically significant. Signers had higher preferences for all the options for representing emotions, with the greatest differences for the combination of small photos of a signer’s face and colour (2.8 cf. 1) and small photos of a signer’s face (2.6 cf. 1.5), but the differences were not statistically significant.
There were 12 comments on representing the atmosphere, 10 on emotions and six on features of speech. Respondents noted the importance of ‘balance …. between information and the time we have to digest it’, that ‘a few words are enough’ and that ‘we deaf people are all face watchers’ and wanted ‘less pictures of the back of people’s heads’, as ‘you can also guess how people are speaking by the facial expressions’. Others wanted to ‘grasp the emotion and feel what they are feeling’. There were suggestions of the use of emoticons and that symbols and words may be preferred to colour, with subtitle colours not being visible when watching programmes on vPlayer. The small number of additional comments showed a preference for text, for instance that ‘pictures are patronising’. Another respondent noted the need for a consistent use of ‘symbols/pictograms’ which were ‘internationally agreed’ and questioned whether this was ‘realistic’.

<table>
<thead>
<tr>
<th>Type of representation</th>
<th>Atmosphere</th>
<th></th>
<th></th>
<th>Emotions</th>
<th></th>
<th></th>
<th>Features of speech</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean score</td>
<td>No. at 4+</td>
<td>Answer Rate</td>
<td>Mean score</td>
<td>No. at 4+</td>
<td>Answer Rate</td>
<td>Mean score</td>
</tr>
<tr>
<td>Atmospheric paintings</td>
<td>2.0</td>
<td>12</td>
<td>51.8%</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
</tr>
<tr>
<td>Atmospheric photos</td>
<td>2.4</td>
<td>17</td>
<td>53.0%</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
</tr>
<tr>
<td>Small photo of face showing emotion</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>1.6</td>
<td>8</td>
<td>N/a</td>
<td>N/a</td>
</tr>
<tr>
<td>Photo of signing hands</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>1.5</td>
</tr>
<tr>
<td>Short text description</td>
<td>3.1</td>
<td>20</td>
<td>50.6%</td>
<td>2.8</td>
<td>14</td>
<td>41.0%</td>
<td>N/a</td>
</tr>
<tr>
<td>Colour</td>
<td>2.5</td>
<td>15</td>
<td>54.2%</td>
<td>1.7</td>
<td>9</td>
<td>50.6%</td>
<td>2.4</td>
</tr>
<tr>
<td>Letter size</td>
<td>3.0</td>
<td>3</td>
<td>7.2%</td>
<td>2.6</td>
<td>17</td>
<td>51.8%</td>
<td>2.6</td>
</tr>
<tr>
<td>Bold or italic</td>
<td>2.8</td>
<td>13</td>
<td>27.7%</td>
<td>2.3</td>
<td>14</td>
<td>50.6%</td>
<td>2.7</td>
</tr>
<tr>
<td>Different fonts</td>
<td>2.1</td>
<td>4</td>
<td>28.9%</td>
<td>2.0</td>
<td>9</td>
<td>50.6%</td>
<td>2.9</td>
</tr>
<tr>
<td>Photo of face &amp; colour</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>1.4</td>
<td>10</td>
<td>47.0%</td>
<td>N/a</td>
</tr>
<tr>
<td>Signing hand photo, colour, size &amp; font</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>2.0</td>
</tr>
</tbody>
</table>

Table 7 - Representation of the atmosphere, emotions and features of speech.

Respondents had greater experience of watching educational programmes, videos and DVDs than attending subtitled lectures or classes, though nearly twice as many had very frequently attended subtitled lectures or classes as very frequently watched educational programmes, DVDs and videos, 60% of respondents preferred subtitles for recorded materials, whereas the preferred option for lectures, though by a minority of 40%, was a combination of subtitles and sign language interpretation. A significant minority wanted sign language interpretation on its own in both cases.

There was limited interest in information on features of the lecturer’s speech or the context in both face-to-face and recorded educational materials, though a significant minority of between just over a quarter and just under a third was very interested in most of the features (Table 8). The greatest interest was in information about the lecturer’s and students’ emotions, with similar average values and numbers of respondents who were very interested (scores of 4+) in both cases. Signers were considerably more interested than speakers in all the features. Their greatest interest was in the speed of speakers for both lectures (3.2 cf. 1.1) and recorded materials (3.1 cf. 1.1) and the differences in both these cases were statistically significant (p=0.017 and p=0.018).

One respondent noted that Open University programmes used to have subtitles, ‘but most of them disappeared a few years ago. Other than that, subtitled educational material is virtually non-existent.’ Additional comments included the importance of not ‘dumbing down’ subtitles
and the importance of the ‘largest group subtitles cater for’ having ‘correct access’, but personalisation to meet the different needs of different (groups of) deaf people is now possible.

<table>
<thead>
<tr>
<th></th>
<th>Mean score</th>
<th>No at 4+</th>
<th>Response rate</th>
<th>Mean score</th>
<th>No at 4+</th>
<th>Response rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loudness of lecturer</td>
<td>1.9</td>
<td>10</td>
<td>43.4%</td>
<td>1.8</td>
<td>11</td>
<td>46.7%</td>
</tr>
<tr>
<td>Speed of speech of lecturer</td>
<td>2.0</td>
<td>11</td>
<td>42.2%</td>
<td>1.8</td>
<td>9</td>
<td>42.2%</td>
</tr>
<tr>
<td>Background sounds</td>
<td>2.0</td>
<td>12</td>
<td>39.8%</td>
<td>1.7</td>
<td>6</td>
<td>43.4%</td>
</tr>
<tr>
<td>Background music</td>
<td>N/a</td>
<td>N/a</td>
<td>N/a</td>
<td>1.4</td>
<td>5</td>
<td>42.2%</td>
</tr>
<tr>
<td>Emotions of lecturer or students</td>
<td>2.6</td>
<td>14</td>
<td>38.6%</td>
<td>2.5</td>
<td>12</td>
<td>39.8%</td>
</tr>
</tbody>
</table>

Table 8 - Interest in information about the lecturer’s speech and the context.

**Discussion and Conclusions**

This paper has presented the results of a survey of deaf people in the UK and Poland on their experiences, attitudes to and requirements of subtitles, including for the representation of emotions and contextual features. It was introduced by a literature overview which demonstrated both the importance of subtitles to deaf people and that they have been criticised for not representing emotions and contextual features and poor legibility in some circumstances. The small number of previous surveys have generally focused on a small number of issue(s) and been limited to one country. A few techniques for representing emotions and contextual features in subtitles have been developed and the reactions of small numbers of viewers investigated using short video clips.

The survey resulted in 83 useful responses from respondents with sufficiently diverse demographic characteristics to give a good representation of the different perspectives in the deaf community. Differences due to country, gender and language (signing or speaking) will be discussed in a subsequent paper. The results confirmed the great importance of subtitles to deaf people. Watching television and viewing DVDs or videos, but not cinema films, were very important activities for the majority of them. Subtitles were (very) important in all three cases and (significantly) improved understanding for over 80% of respondents. In line with the literature, 80% wanted verbatim subtitles either always or unless they were very complicated.

Comments indicated that they considered simplification ‘very patronising’ and wanted to be ‘on an equal footing with hearing people’. A significant minority of about 10% found subtitles (very) difficult to read, that they were displayed for insufficient time and wanted longer to read them. This is probably related to the fact that just over 11% found reading (very) difficult. A majority of respondents considered that at least some interesting TV programmes, DVDs and videos lacked subtitles though UK respondents noted the ‘good [TV] coverage’. They were generally happy with the quality of pre-recorded and DVD subtitles, but considered that live subtitles needed to be improved, but not by revoicing, which had made the situation worse. Concerns were expressed about the lack of information about important sounds on DVDs, the lack of subtitling of extras and the lack of information from online sellers about whether a DVD has subtitles. Cinema-goers were concerned that advertised subtitles were not always turned on.

A majority of respondents wanted information about the feelings of the main characters and the text of either all songs or those that were part of the scene. Significant minorities were interested in information about the atmosphere, the feelings of other characters, the loudness of all characters and background sounds. The suggested graphical representations aimed to give equivalent emotional and visceral reactions to music. However, the highest average scores were obtained by short text descriptions and modifications of the text format, though signers showed greater interest in graphical representations than speakers. Although the average interest in the suggested representations was low, most of the representations were of interest to a significant minority of respondents.
Respondents had greater experience of subtitles on recorded than face-to-face educational presentations. The majority preferred subtitles for recorded materials. The largest preference by a significant minority was for a combination of subtitles and sign language interpretation for lectures. Interest in all the suggested contextual features was fairly low, but greatest for information about lecturers’ and students’ emotions. Signers were more interested than speakers in all the types of information, with their greatest interest in the speed of speech.

The varying degrees of interest expressed in receiving information about emotions and different contextual features, as well as in the different representations, and the minority of respondents who wanted a shortened version of subtitles with longer to read them indicate the need for research to develop personalisation systems for subtitles, including verbatim and edited versions. Personalisation will allow viewers who want them to benefit from graphics, colour and/or animation without irritating others or making the text more difficult to read for them. The increased flexibility and options provided by digital media have made personalisation feasible.

This leads to the following recommendations:

- Care in the use of (loud) music, particularly when characters are talking, to avoid making it difficult for deaf people to understand the speech.
- Separate instructions for background music, analogously to closed subtitles, to enable it to be turned on or off and the volume adjusted separately from the main programme.
- Subtitling of all cinema films and DVDs, including ‘extras’ and ensuring that advertised subtitles are turned on.
- Verbatim subtitles and the inclusion of the text of songs that are part of the scene as the default.
- Research, technical development and large scale end-user testing with deaf and hearing people and long video clips in various genres:
  * Live subtitling systems with improved accuracy, synchronisation and quality. This should be considered a priority.
  * Subtitle personalisation systems which allow various features to be easily turned on and off, including shorter text in simple language, the texts of background songs and various representations of emotions and contextual features.
  * Suites of options for representing a wide range of emotions and contextual features.

**Acknowledgements**

I would like to express my great thanks to everyone who completed questionnaires and/or helped me distribute them.

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Endnotes

1. The term ‘deaf’ will be used, unless otherwise indicated, to indicate deaf, Deaf, deafened, hard of hearing and hearing impaired people and ‘Deaf’ for people who sign and consider themselves members of the Deaf Community.
The 1 in 4 Poll project seeks to increase understanding of the views and needs of people with a disability by developing an accessible survey method. It is being conducted by Deakin University in partnership with the Victorian disability service provider, Scope.

To address this goal, the 1 in 4 Poll method has focused on three key strategies: an accessible Internet-based survey; use of an assisted and proxy report; and a ‘standard’ and Easy English version of the survey. A bespoke online survey design seeks to overcome the limitations in accessibility of available online survey tools. Positive evaluative comments, from respondents across a wide-range of disabilities, suggests that the combination of the three major strategies used in the 1 in 4 Poll has resulted in a valuable and accessible method of large scale surveying of people with a disability.

Introduction

People with a disability represent a significant proportion of the Australian population with approximately one in five Australians reporting a disability (Australian Bureau of Statistics 2003). Additionally, there are more than 2.5 million Australians who are carers (Cummins; Hughes et al. 2007). Together, people with a disability and their carers constitute more than 1 in 4 of all Australians. The 1 in 4 Poll project is being conducted by Deakin University in partnership with the Victorian disability service provider, Scope. The project aim is to develop an accessible research method for obtaining the views of people with a disability.
People with a disability and their carers constitute one of the most marginalised groups in Australia despite their relatively high proportion of the overall population (National People with Disabilities and Carer Council 2009). Evidence suggests that the number of Australians with a disability is increasing (Australian Institute of Health and Welfare 2006, 2007) and, given Australia’s ageing population, this trend is likely to continue. Despite growing numbers, people with a disability and their carers continue to struggle to give voice to the issues and concerns they face. They are often excluded from participation in political dialogues and democratic processes, and hence decision making processes that greatly affect them. This exclusion is highlighted in a recent Australia-wide consultation of people with a disability and their carers:

‘People with disabilities may be present in our community, but too few are actually part of it ... They struggle to be noticed, they struggle to be seen, they struggle to have their voices heard’ (National People with Disabilities and Carer Council 2009: 16).

In contemporary democratic society, the notion that all citizens have equal opportunity to express their views and opinions is a fundamental principle underlying human rights and anti-discrimination legislation (Berry et al. 2006). This principle is currently enshrined in the United Nations Convention on the Rights of Persons with Disabilities (CRPD) (United Nations 2006) which was ratified by the Australian Federal Government on 17 July 2008.

One means of enhancing the socio-political capacity of people with a disability is through research and, in particular, via the use of large-scale surveys which provide an opportunity for citizens to report on their life experiences and opinions. Many such large-scale surveys often exclude people with disability either deliberately or through methodological design that does not allow for the ways in which certain people with disability communicate, or to allow for the physical barriers that may inhibit survey completion (Parsons et al. 2001; Lloyd et al. 2006; Carlsson et al. 2007; Kroll 2011). The notion of an accessible design has not been applied meaningfully to research and social surveys thereby excluding many people with a disability. As Parsons et al (2001) argue, ‘(t)here is little attention given in the academic survey literature (and most probably, in common survey practice) to how many “standard” procedures serve systematically to exclude persons with disabilities from research of the general population’ (2001: 180).

Including people with a disability in surveys provides information for research, policy making, and advocacy (Keer 2007: xi). Yet ‘if people are systematically excluded from research participation, their needs, experiences, perspectives are rendered invisible’ which skews the evidence base therefore affecting evidence-based practice (Kroll 2011: 67). As Kroll states, this exclusion of people with a disability ‘may bias the choice of outcomes, the effectiveness of evaluation of rehabilitation interventions, and ultimately the adoption of “best practices” and intervention guidelines’ (Kroll 2011: 67). Thus, researchers, service providers and governments remain uninformed about the experiences and views of people with a disability who are unable to participate easily and effectively in self-report activities.
Research Methods and their limitations

Overcoming barriers to inclusion in research

Researchers need to incorporate adaptations and supports in their data collection procedures based on the assumption that perspectives of people with a disability, including those with cognitive impairments, are ‘credible and valuable’ (Mactavish et al. 2000: 217). Parsons et al (2001) argue that ethical guidelines relating to the conduct of human research also require researchers to take account of the special needs of vulnerable groups. Failure to make these accommodations, that is, to implement strategies to overcome exclusions related to impairments, can be understood as a breach of human research ethics as well as a breach of human rights (Office of the Commissioner for Human Rights 2010).

A central idea flowing from this is the right of people with a disability (whether physical or cognitive) to self-report, or communicate directly, about their own views and experience. There is now a growing body of literature that reports on barriers to self-reporting for people with a disability as well as the research method design strategies that can be employed to overcome these issues. This is a complex and growing area of study. The following discussion, though not exhaustive, seeks to outline common themes in the literature as a background to the 1 in 4 Poll method, focusing on data collection issues and strategies.

Strategies to maximise self-report of people with a disability

Barriers to inclusion in research for people with intellectual or cognitive disabilities

There is now a sizeable body of literature that deals with barriers to inclusion in research for people with intellectual or cognitive disabilities. Common barriers are reported to be cognitive issues such as lack of a concrete frame of reference, difficulty with abstract concepts, difficulty with temporal concepts, limited literacy and vocabulary, communication barriers including unresponsiveness and inarticulateness, limited attention span, and fatigue (Booth & Booth 1996; Paterson & Scott-Findlay 2002; Whitehurst 2006; Carlsson et al. 2007). The format and presentation of research questions and information can also act as barriers to the meaningful participation of people with cognitive impairments (Rodgers & Namaganda 2005).

A key strategy to overcome these barriers discussed in the literature is the use of various enhancements such as visual aids, symbols, tapes/videos, simple words and clear questions, and story technique (Owens 2007; Kroll 2011; Parsons et al. 2001). There is a significant set of literature (see Kroll 2011 citing a range of research) that deals with the use of visual and pictorial enhancements for assisting the communication of people with intellectual disabilities (including literature related to augmentative and alternative communication (AAC)). For example, Kroll (2011) highlights the use of visual scaling and the Talking Mats technique.

Ruddick and Oliver (2005) place the emphasis on the design of question format, noting that ‘when questions are carefully constructed, people with intellectual disabilities have … been shown to provide valid information about their subjective psychological and emotional states’ (2005: 144). In addition, Kroll (2011) argues that prior testing of material and presentation is required to ensure its cognitive match to respondents.

Overall, researchers argue that the data collection design needs to be undertaken with a clear understanding of the preferred communicative modes and optimal communication environments of respondents (Whitehurst 2006; Owens 2007).

Barriers to inclusion for people with complex communication needs

Barriers to inclusion in research for people with a wide range of speech impairments and complex communication needs, sometimes linked to intellectual disability, are varied. Kroll (2011) identifies the need to provide sufficient time for answer formulation, as well as specifically enabling the use of augmentative and alternative communication modes which may additionally require appropriate seating and lighting for use. Similarly, data collection
and recording methods need to be matched to the, possibly multiple, communication modes in use, including written, audio and video data collection techniques (Kroll 2011).

A range of studies report the importance of recognising the role of communication partners - usually personal assistants, carers or family members - in facilitating and interpreting communication (Kroll 2011; Cambridge & Forrester-Jones 2003; Owens 2007). Other studies have focused on strategies for enabling the participation of those with very limited levels of spoken language. Cambridge and Forrester-Jones (2003) report on the effective use of individualised communication approaches involving a variable mix of signs and symbols already in everyday use that reflect the vocabulary used by the person that was relevant to the study topic, supplemented by the use of photographs.

**Barriers to inclusion for people with physical and sensory disabilities**

People with a broad range of physical and motor impairments can be excluded from research for a variety of reasons. In some cases, people have difficulty accessing research data collection sites (eg interview venues), or answering the door to an interviewer (for example in household surveying) (Parsons et al 2001). Data collection methods (including the use of various instruments) can be inaccessible for people with physical disabilities (Kroll 2011).

For example, various motor impairments contribute to an inability to respond in particular formats such as providing answers in writing (Kroll 2011). For people who are deaf or hearing impaired, face to face interviews pose a particular problem, though provision of text is a strategy that addresses this for those who have this literacy. The use of telephone typewriter or teletype (TTY) can be a strategy for phone interviewing, though Parsons et al (2001) conclude that the variety of TTY types with different character and word limits makes it difficult to design questions to suit this breadth of variation. The use of sign language is also not straightforward, given there is no written form, and questions may not translate directly (Parsons et al 2001), nor are scales easily translatable or validated in this form (Kroll 2011). For people with hearing impairments, a common problem is that questions may not be heard (Kroll 2011).

Visual impairments frequently affect respondents’ ability to read questions and respond (Parsons et al 2001). One method of addressing such difficulties is to provide large print versions (Parsons et al 2001) as well as ensuring surveys are available in different formats - for example, some visual impairments render black print on a white page illegible. The use of high contrast text fonts and colours is suggested by Parsons et al (2001), along with the use of Braille translation of survey material, as well as audio opportunities to hear the question and to record answers.

**Assisted self-report**

While the strategies discussed above identify ways to design data collection to enable the self-reporting by many people with disabilities, new understandings of ‘self-report’ also need to be part of an accessible research design. In particular, self-report needs to be understood as both an independent task, as well as an assisted or supported one. A documented strategy of supporting the rights of people with a disability is the provision of support to participate, within an understanding that autonomous action can encompass dependence on such support without compromising autonomy (see for example Davidson 2007). This notion has found some application within accessible research design for people with physical as well as intellectual disabilities, and it is argued that assisted response is ‘superior to response entirely by another person, and … to no response’ (Kaye 2007, 123). Kaye argues that people with disability, who have difficulty answering survey questions, need to be allowed an assisted response ‘in which the person responds with help from a family member or caregiver’ (Kaye 2007, 105). He further argues that assisted response is a preferred method to proxy as it relies on direct answers from the respondent rather than assumptions made by a proxy. A number of studies have shown that assisted response can include a range of types of assistance, and that it increases the response rate of people with a disability (Layton et al. 2010; Kaye 2007; Kroll 2011 citing Young and Chesson 2006).
Proxy report

While self-report is the ideal, the nature of impairment can however act as an insurmountable barrier to self-report for some people with a disability, particularly those with severe to profound intellectual disability, and those with informal levels of communication. To date, the dominant strategy to include this group is that of proxy report. There are differing perspectives as to whether the use of proxies is deemed better than not obtaining any information at all (Parsons et al. 2001). Proxies may have a different perspective on the value of the research compared to the person with a disability and may act as a ‘gatekeeper’ (Carlsson et al. 2007). Also a proxy may provide more information based on their own experiences rather than the experience of the person with a disability (Ison 2009). Generally, proxies are regarded as more accurate when it comes to objective information about the person whose views are being sought but may be less accurate when it comes to subjective ideas and opinions or sensitive information (Hendershot 2004; Kroll 2011; Parsons et al. 2001; Watson 2012).

Parsons et al. (2001) note that the advocacy community advise that ‘researchers should always assume that the respondent can answer for himself or herself, even if the assistance of special technology or a translator is required’ and that most people with disabilities don’t want others answering for them (Parsons et al. 2001, 175).

Selecting appropriate large-scale survey methods

The above barriers apply to a range of research methods including large scale data collection. There are a variety of methods possible for large sampling that have been used to obtain the views of people with a disability. They include telephone surveying, paper-based surveys, email and Internet-based surveying. All of these have strengths in terms of accessibility and gathering of reliable data, but also limitations. There is a small amount of literature that specifically addresses the inclusion of people with a disability, and the barriers and strategies used for each of these methods. Issues relating to household surveying by phone and door-to-door have been examined by Parsons et al. (2001) and Kroll (2011). Paper-based surveying has also been explored by Parsons et al. (2001) and Stalker, Gilliard & Downs (1999). The use of email as a mode of surveying has recently been explored by Egan et al. (2006) and Ison (2009). These studies highlight many of the issues and strategies discussed above, and apply them to these particular modes of data collection. For the purposes of the 1 in 4 Poll project, the use of Internet-based surveying was of most interest and appeared to have the potential to overcome, through effective design strategies, many of the barriers inherent in other methods. A short overview of issues - including design - in the use of Internet-based surveying for people with disabilities is presented below.

Appropriate Internet-based survey design for people with a disability

One of the strengths of Internet-based research is the potential to reach across geographical boundaries and to reach hidden or difficult-to-reach populations (Cook et al. 2007; Wright 2005). It is argued that the medium may encourage more honest answers to personal and sensitive questions (Eckhardt & Anastas 2007) by providing a degree of anonymity and confidentiality that surpasses other approaches such as face-to-face interviews or even mail surveys (Cook et al. 2007; Wright 2005), though such anonymity may also negatively affect validity (Wright 2005). Technological solutions made available by Internet-based surveying also include specific adaptations or assistive technology designed to address physical, sensory and communication impairments.

However, as with all survey methods, there are barriers as well as enablers regarding accessibility. Various concerns about the value of Internet-based surveys include the inability to calculate response rates, the possibility of multiple responses from the same respondent, the ‘digital divide’ (with many people excluded from computer or web-access), and literacy levels that may make using such a survey method problematic (Davies et al. 2001; Blair 2006;
Eckhardt & Anastas (2007). McKenzie (2007) noted that while many people experience difficulties navigating around sites, the annoyance experienced is likely to be multiplied for people with learning difficulties ‘to the extent that it may present an insurmountable obstacle’ (McKenzie 2007, 19). A study by Vaccaro, Hart, Whyte & Buchhofer (2007) noted a number of difficulties experienced by people with a disability including forgetting procedures or passwords, ‘going in circles’, taking a long time to find things, difficulty in understanding content, difficulty in identifying appropriate keywords, not being able to find the right answers to questions, and losing focus and patience (Vaccaro et al. 2007, 91).

For visually impaired users, Murphy, Kuber, McAllister, Strain, Yu (2008) reported on a survey carried out by the U.K. Disability Rights Commission that highlighted barriers regarding the failings of assistive technologies and inadequate presentation of web sites. Web pages are often difficult to interpret when using assistive aids such as text-to-speech synthesizers and Braille output devices. In addition, some assistive devices inadequately handle graphics, moving images, frames, tables, use of scripting languages and streaming audio and video. Similar barriers were revealed by the findings from the European Internet Accessibility Observatory Project (Craven 2005). Murphy et al (2008) found that current assistive technologies are inadequate in providing access to information due to navigational constraints, and that complex page structures are confusing for the visually impaired.

This discussion highlights the key element of accessibility or ‘usability’ where respondents can perform the tasks they wish to (Abascal & Nicolle 2005). It is therefore important to consider an accessible interface to perform the tasks associated with a survey on the Internet which needs to be designed with consideration of the ‘physical, perceptual, and intellectual characteristics of the end-user population’ (Davies et al 2001, 109).

Overall, it would appear that the Internet has the potential to increase the inclusion of people with disabilities in the social and political world though any survey design needs to consider a variety of barriers to ‘usability’. As Zubai-Ruggieri highlights: ‘The use of the Internet gives people power to express themselves, have a voice’ (Zubai-Ruggieri 2007, 210).

**The 1 in 4 Poll method**

The 1 in 4 Poll project aims to develop a method of surveying adults with a wide diversity of disabilities across Australia. As the 1 in 4 Poll survey was intended to be offered for completion to a large and diverse population, the researchers focused on a limited set of design strategies that aimed to address some, though not all, of the barriers to participation discussed above.

Overall, the project team focused on three major data collection design strategies. First, the survey was designed to foster maximum participation through allowing both assisted and proxy reports. Second, researchers focused on developing an accessible Internet-based survey method, supplemented by more traditional hard copy dissemination and completion strategies. Finally, researchers developed several versions of the survey instrument, including a ‘standard’ English format (though with attention paid to clear language and formatting), as well as an Easy English format that utilised plain or simple language, large font, was in color and used visual or pictorial symbols as supports to written language (see for example guidelines and suggestions in Finlay and Lyons 2001). The research strategies are explained below and were approved by Deakin University’s and Scope’s Human Research Ethics Committees.

**Assisted and proxy report**

The emphasis for the 1 in 4 Poll was on self-report. However, it was recognised that despite all efforts to improve accessibility for people with a disability to self-report, some people may prefer or require assistance to complete, while others may be unable to participate except via a proxy. It was decided that providing a variety of methods to respond – i.e. self-report, with assistance, or by proxy – was a key component of accessibility. Survey design included
explicit instruction, at numerous points, that advised that both assisted response and proxy response was to be from the ‘person with a disability’s view point’.

It was hoped that this explicit instruction would reinforce the notion of self-report, even where differing levels of assistance were provided. While this may not address concerns regarding the validity of response where proxies answer subjective questions (as previously discussed), it was deemed an important strategy to enable participation of a group of people who would otherwise be excluded. However, it should be noted that there are no mechanisms within this iteration of the survey to test the reliability of assisted or proxy response.

**Accessible Internet-based survey**

Researchers for the 1 in 4 Poll opted for an Internet-based survey as the most appropriate method for large-scale sampling. As the previous discussion on Internet-based surveying showed, this method has limitations of its own. However, researchers for the 1 in 4 Poll have attempted to address some of the pertinent barriers associated with an Internet-based survey method as will be discussed below.

To begin constructing the 1 in 4 Poll web site there was the question of whether to use one of the range of online survey programs that are available, or whether to develop one for the purposes of the project. Given the key criteria was accessibility, consideration was given to evaluating the accessibility of the available online survey programs. A comparative effectiveness analysis of multiple online survey programs was undertaken by utilising International Guidelines for Web accessibility - principally Web Content Accessibility Guidelines (WCAG) and US Rehabilitation Act Section 508 standards. WCAG version 1 is a series of technical and design guidelines to minimise user difficulties for people with a disability accessing the web, while part of US Section 508 contains 16 compliance points for online accessibility for people with a disability (for more information see Gottliebson, Layton, Wilson 2010). Eleven popular online survey tools were evaluated against the key guidelines for their effectiveness. Only one - ‘Only a Survey’ - had no accessibility problems though it had an inflexible layout and limited options for question types. The other programs examined had varying degrees of accessibility problems. In all, the comparative effectiveness process did not yield an identifiable tool to ensure adequate accessibility for people with a disability (Gottliebson et al 2010).

In order to maximise accessibility for people with a disability, a bespoke survey was commissioned and evaluated. Strict conformance to all WCAG guidelines resulted in a simple design with initial testing finding that it conformed to all the assessment criteria, making it more accessible than any of the generic survey engines (Gottliebson et al 2010). The model included key features such as simple layout with an absence of unnecessary design features, high contrast and larger sized font, vertical formatting for scales and item choices where possible, the use of radio buttons rather than a mouse-operated sliding scale, among other features required by the accessibility guidelines (see those described by Gottliebson et al 2010, 405). This bespoke model was initially used in an unrelated research project, an online survey of adults with a disability in Victoria, and was accessed by a diverse group of people with a disability (n=100) (Layton et al 2010). Given this tested level of accessibility, the bespoke online survey model was subsequently adopted for the 1 in 4 Poll. It should be noted that this model was a step below that recommended by Gottliebson et al (2010, 408), in that it made compromises to offer a single accessible format, rather than ‘an adaptative approach’ where the web server was able to automatically adapt the offered layout to suit user needs. This approach was beyond the scope of the 1 in 4 Poll project.

It should be noted that researchers also made available hard copies of the survey instrument. This mixed-mode approach, which offers an alternative method of response (Parsons, Baum, Johnson 2000), was an attempt to accommodate potentially eligible respondents who may not otherwise be able to participate.
How did we go?

Completion rates

The first 1 in 4 Poll survey was based on the topic of social inclusion and was available for completion online between October 2010 and September 2011 at www.1in4pollaustralia.com. Over this time 1340 attempts were made to complete the survey with 761 respondents doing so successfully. Respondents included those with a wide range of disabilities, including physical (24% of respondents), intellectual (15%), neurological (18%), sensory (9%), psychiatric (6%) and others. Of these, thirty six respondents completed the poll in hard copy rather than online and mailed in their responses. Overall, the data shows that respondents from all disability types, successfully utilised the online format of the survey.

Data was gathered in regard to the mode of completion, including levels of assisted and proxy response. Of the 761 completions, 67% completed the survey independently, 16% completed with assistance, while 17% were completed by proxy. A range of disability types utilised assisted response including those with intellectual disabilities (comprising approximately 37% of those using assisted response), physical (18% of assisted response), sensory (8%), and psychiatric disabilities (5%).

Data was also gathered as to the number of people using the Easy English version as opposed to the Standard English version. By far the most popular version was the Standard English which was completed by 85% of respondents. Overall 117 (15%) respondents used the Easy English version. Of these, the majority identified intellectual disability as their primary disability (35%), while those with physical (14%), sensory (9%) and speech related (3%) disabilities, among other disability types, also comprised the user group of this version. Of those who completed independently, 10% used the Easy English version, while just under half (44%) of those who completed with assistance used the Easy English version. Of those surveys completed by proxy, 10% were the Easy English version. Overall, this appears to indicate that while the standard version was favored by the majority, many respondents took advantage of the opportunity to complete the survey using an Easy English version, particularly when a person with disability was completing with assistance. Arguably this indicates that providing a more accessible Easy English version enables people to complete it who may not otherwise have been able to. What the numbers don’t tell us is whether people found either version inaccessible and therefore did not complete it.

Respondent Feedback

An important aspect of the development of an accessible data collection method for people with a disability is the evaluation of its effectiveness. To this end, a number of evaluative questions were included in the 1 in 4 Poll survey.

In order to gauge the user-friendliness of the 1 in 4 Poll, respondents were asked ‘to what extent did you find the survey easy to understand and fill out?’. Overall the results were highly positive. On a scale ranging from ‘hard to use’ (0) to ‘easy to use’ (10), 50% of the respondents rated the poll as 10. Of the two versions, the mean response for the Standard English version was 8.83 (out of 10) and 8.11 for the Easy English version. Data was analysed to identify results for users according to their identified impairment. The lowest user-friendliness rating was recorded by people with intellectual disability whose mean response for user-friendliness (combined for both versions) was 7.67, while those with vision impairment provided a mean rating of 8.05.

Respondents were also asked to suggest any improvements to the survey. Many responses related to the content area of social inclusion. Ninety three (93) of the 146 comments received related specifically to the overall user-friendliness of the survey (see table 1).
Table 1 - Survey respondents’ comments and suggestions in relation to survey accessibility

<table>
<thead>
<tr>
<th>Comments and Suggestions</th>
<th>Total Number of Individual Mentions</th>
<th>Summary of Respondents’ Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approval of survey accessibility</td>
<td>40</td>
<td>• Easy and quick to use/complete</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Simple format</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Very accessible with a screen reader</td>
</tr>
<tr>
<td>Layout difficulties</td>
<td>11</td>
<td>• Make circles to click in bigger</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Had to scroll across screen to read the full question</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Too many pages/information to scroll through before starting survey</td>
</tr>
<tr>
<td>Language comprehension / ambiguous</td>
<td>8</td>
<td>• Complex preliminary text</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Questions ambiguous – could be more specific</td>
</tr>
<tr>
<td>Technical difficulties</td>
<td>7</td>
<td>• ‘Save’ and ‘continue’ options sometimes failed</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Timed out and didn’t save</td>
</tr>
<tr>
<td>Auslan required</td>
<td>5</td>
<td>• Provide an Auslan version of the survey</td>
</tr>
<tr>
<td>Audio required</td>
<td>4</td>
<td>• Easier to use if audio option (in relation to people who don’t use/have screen reader software but may have intellectual disability)</td>
</tr>
<tr>
<td>More pictures</td>
<td>3</td>
<td>• More pictures to help understand</td>
</tr>
<tr>
<td>Clearer instructions</td>
<td>3</td>
<td>• Too wordy</td>
</tr>
<tr>
<td>Dislike scale</td>
<td>2</td>
<td>• Don’t like 1-10</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Scaling complex</td>
</tr>
<tr>
<td>General comments</td>
<td>10</td>
<td>• Needs meter to tell how far through the survey you are</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Briefer survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• More reassurance regarding confidentiality</td>
</tr>
</tbody>
</table>

Of the 93 responses, 40 people indicated in their comments that the survey was easy to use. Eleven people indicated a variety of layout concerns, eight people noted that the wording was unclear or ambiguous, while seven people experienced some form of technical difficulty. While numbers were small, other key suggestions included the need for an Auslan option (5 people), and audio options (4), particularly related to people with an intellectual disability rather than vision impairment. Overall, these comments suggest respondents found the survey relatively easy to use though a number of respondents have identified specific issues that need to be considered. It is possible that those who found fault with the method and didn’t find it accessible, may not have been able to adequately record their views hence the bias towards the overall positive appraisal from those who were able to successfully complete the survey.

Conclusion

The 1 in 4 Poll survey method is an attempt to develop reasonable accommodations to research methods to enable the participation of people with a disability. The challenge in designing an accessible data collection approach is to overcome communication, physical and cognitive barriers, and to design a method whereby respondents can understand the questions,
communicate according to their preferred method, and access the data collection instrument with minimal inconvenience. To address this challenge, the 1 in 4 Poll method has focused on three key strategies: a focus on self reporting supported by assisted and proxy report; an accessible Internet-based survey; and two versions of the survey instrument, including ‘standard’ and Easy English versions. These strategies attempted to draw on and incorporate, where possible, many of those already identified in the research literature regarding appropriate research methods for people with a disability.

The bespoke design sought to overcome the limitations in accessibility of available online survey tools by ensuring adherence to WCAG guidelines. This, along with the number and diversity of the respondent group with their strongly positive evaluative comments, suggests that the combination of the three major strategies used in the 1 in 4 Poll has resulted in a valuable and accessible method of large scale surveying of people with a disability. Caution though needs to be applied in final conclusions of method effectiveness given the overall positive bias from those who successfully completed the survey. However, these findings highlight it is possible to enable the participation of people with disability in research and that it is the responsibility of researchers to make necessary accommodations.

Acknowledgments

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‘If you leave it with me I will work it out’
The benefits and challenges in using mainstream devices as assistive technologies for people with disabilities

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The increasing availability of mobile technologies incorporating universal design features has provided a more affordable assistive technology solution for many people with disabilities. However, several authors caution that there are possible negative by-products associated with this trend, highlighting the need for further research into the benefits and challenges of using mainstream devices as assistive technologies. This paper reports the interim findings of a project involving the trial of iPads with two participant co-researchers who have physical disabilities and ten residents of a high support institution for people with disabilities. The project methodology involved: 1) evaluation of participants’ use of the devices; 2) pre- and post-intervention testing using goal attainment scaling; 3) training and ongoing support in use of the device; and 4) analysis of user satisfaction with the iPad using a modified version of the Quebec User Evaluation of Satisfaction with Assistive Technology instrument. The study contributes to the growing evidence-base exploring the potential of mainstream mobile devices as assistive technologies and highlights areas for further research and development.

Introduction

The ubiquity and affordability of mobile technologies, such as smart phones and tablet devices (for example iPhones and iPads), has led to increasing interest in the potential of such mainstream devices as augmentative and alternative communication (AAC) options for people with complex communication needs (CCN, RERC on Communication Enhancement 2011). The appeal of such mainstream devices extends beyond their use as AAC technologies given their multifunctional capabilities (Schulz & Fugerlud 2010) and integration with a broad range of communications options (RERC on Communication Enhancement 2011), such as email, browsing the web, instant messaging and social networking.
Many of the currently available mainstream mobile devices incorporate universal design features (see Schulz & Fugerlund 2010 for comparative review of the accessibility features of several popular mobile technologies), and there are many companies building on these features to develop assistive software applications (for example Therapy Box Apps and AssistiveWare) as well as alternative interface options such as switches, head pointers, joysticks and mounting solutions (see for example the range of accessibility solutions distributed by Spectronics and Zyteq in Australia). Given the affordability of these mainstream devices compared to the cost of dedicated AAC technologies and their perceived ‘coolness’ factor (RERC on Communication Enhancement 2011), it is not surprising to find many describing the iPad as ‘a game changer’ (McLeod 2011; Rummel-Hudson 2011; Sennott 2011), a ‘disruptive force’ (Janger 2011) in challenging traditional approaches to AAC, and a major contributor to the ‘democratization of AAC technology’ (RERC on Communication Enhancement 2011) for people with CCN.

Despite this potential, experience has shown that there are dangers in assuming that mainstream devices incorporating universal design principles can offer a ‘one size fits all’ solution, will be culturally appropriate and will suit the needs of a diverse population of people with disabilities (Emiliani, Stephanidis & Vanderheiden 2011; Harris 2011; Ripat & Woodgate 2011). As a report by The Rehabilitation Engineering Research Center on Communication Enhancement (RERC) cautions, there are also potential negative by-products resulting from this trend, including loss of technical support, lack of quality control, less customisation, costs in monthly service agreements and abandonment if devices do not live up to expectations, and as a result, ‘hoped for communication goals may not be realized’ (RERC on Communication Enhancement 2011: 4). These cautionary reports highlight the need for a stronger evidence-base to guide the development of new and emerging mainstream technologies employing the principles of universal design (Hersh 2011; RERC on Communication Enhancement 2011) and the participation of people with disabilities must be central to this process (Blackstone, Williams & Wilkins 2007; Buhler, Engelen & Soede 2011; Harris 2011).

This paper reports the interim findings of a pilot project supported through a Telstra Corporation grant\(^1\), Therapy Box\(^2\) in the UK, and Zyteq\(^3\) assistive technology in Australia, which responds to this gap in the literature by exploring the potential benefits of iPads as assistive technologies.

**Background**

In this section of the paper we explore the universal design features of smart phones and tablet devices, and the associated software applications (apps) designed to accommodate a range of accessing needs, as well as the growing availability of alternative input devices enabling those who cannot use the standard on-screen keyboard via direct selection the ability to use these devices as assistive technologies. This section also elaborates on some of the challenges alluded to in the introduction and concludes with an argument for the need for further research to address these challenges.

**Universal design features of mainstream mobile devices**

‘Universal design’ is an area of concern that has gained considerable momentum in recent years. Universal design can be described as a ‘socially conscious, general approach to designing in which designers ensure that their products, environment and services address the needs of the diversity of users of products, irrespective of users’ age, ability or cultural background’ (Tahkokallio & Koivusilta 2004). The key elements in universal design are said to include: providing interoperability; providing accessibility to users with disabilities; and providing customisation and localisation features for people from different countries and cultures (Usability First 2013).

While Apple Computer ‘iDevices’ (for example iPod, iPhone and iPad devices) were among the first of the suite of mainstream mobile devices to incorporate universal design features
There are also a growing number of Android based mobile devices, which also incorporate many of these features as well as an increasing number of Android apps designed to meet the assistive needs of people with disabilities (Higginbotham & Jacobs 2011). More recently, Windows 8 based tablet computers have hit the market; these devices incorporate many accessibility features and have extended and improved on the features built into previous versions of the Windows operating system. There are also a growing number of accessible apps available from the Windows app store (Hollier 2012) designed to leverage the universal design features of the Windows 8 operating system and multi-touch interface.

The features that have made iDevices popular as alternative assistive technologies include (Perez 2011):

- **VoiceOver**, which is a gesture-based screen reader enabling people with visual disabilities to use the touchscreen interface.
- **Zoom** enabling users to magnify the screen up to 500X for people with low vision.
- **Large Text**, making it possible for user to increase the size of the text in most built-in apps.
- **Speak Selection** which makes it possible for users to listen to highlighted text read aloud (an option which assists users who have vision impairments).
- **White on Black**, high contrast option for users with visual impairments.
- **Mono Audio**, which enables users to play both stereo audio channels in each earpiece for those who have hearing loss in one ear.
- **Closed Caption** support, enabling users with hearing impairments to enjoy movies, TV shows and video podcasts.
- **AssistiveTouch** making it easier for people with motor difficulties to perform Multi-Touch gestures.
- **Siri** described as a ‘personal assistant’ that uses voice recognition and artificial intelligence to respond to a range of user queries by voice and Dictation which provides a voice-recognition based alternative to keyboard entry.
- **Custom Gestures** enabling users to create their own custom gestures to match their accessing needs.
- **Typing Shortcuts** for stored commonly used phrases.
- **Vibration Alerts** which provide non-auditory alerts for users with hearing impairments or those with sound turned off.

iDevices also include a rapidly increasing number of third-party apps available through Apple’s iTunes store, which make use of the universal design features of the devices and are designed to provide assistive technology support. Importantly, many of the apps now available through software distributors such as Therapy Box incorporate support for a range of alternative input systems including switches, key guards, head pointers and joystick controllers. There are also a range of special mounting devices now available enabling the iDevice to be mounted on a wheelchair or hospital bed.

Given the universal design features of these devices, the range of apps and interface solutions now available, it is not surprising to see assistive apps ‘springing up all over’ (Goldman 2011) as well as a more worrying trend emerging whereby potential consumers are searching for a ‘quick fix’ (Gosnell et al 2011:). As researchers and clinicians caution, ‘while this platform may indeed be a good match to the strengths and needs of some individuals, it is not a match to the communication needs of many with complex communication needs’ (Gosnell et al 2011: 7). This next section outlines some of the concerns about the widespread adoption of mainstream mobile devices as alternative assistive technologies.
Challenges in the use of mainstream mobile devices as assistive technologies

One of the overriding concerns expressed by clinicians is the need for ‘feature matching’ assessment (Shane & Costello 1994), which is a process that aims to ensure that the device, apps and interface solutions are suitable for the individual. As Gosnell et al (2011) explains, this ‘feature matching’ assessment process aims to identify the individual’s strengths and needs, and match those needs to the most appropriate tools and strategies. Such assessment takes into account the individual’s current and future needs. While this has been a long-established process in prescribing assistive technologies for people with disabilities, the trend towards consumers purchasing the device and apps first without consultation with a therapist, or more concerning, a therapist or educator identifying a solution without undergoing the ‘feature matching’ assessment process can lead to a focus on attempting to ‘fit the student/patient into an iDevice platform and app’ (Gosnell et al 2011: 8). McBride (2011) echoes these concerns suggesting that the failure to engage in established sound AAC evaluation principles and procedures can lead to ‘dire consequences’. The dire consequences McBride refers to here relate to the danger that consumers will waste valuable resources purchasing devices and apps that do not meet their needs, the technology may be abandoned, or even worse, as McBride cautions, could lead to the user abandoning AAC altogether (McBride 2011: 9).

A second major area of concern expressed by clinicians resulting from side-stepping the evaluation and assessment process typically followed in ‘feature matching’ is the risk that this process does not and should not end with the selection of an appropriate assistive technology solution. The AAC-RERC White Paper (RERC on Communication Enhancement 2011) has emphasised that the assessment process begins when the individual is scheduled for assessment and includes a decision-making process involving a team of professionals, family members, and carers, as well as the individual. During this process the needs and goals are agreed upon and the assessment is followed up with a request for recommended equipment, training, technical support and regular follow up. In the case of individuals with CCN, there may be a range of other considerations and additional ongoing support requirements taking into account the individual’s current communication contexts, current interests and their desire to use communication tools in everyday activities (McBride 2011: 11). Moreover, the availability and engagement of the individual’s communication partners will either enhance the implementation and use of the device or undermine the outcomes (McBride 2011).

The third area of concern is the current lack of empirical evidence demonstrating the efficacy of mainstream mobile devices as assistive technologies. While anecdotal accounts of the success of iPads and similar devices abound (Gosnell et al 2011:), the AAC-RERC White Paper (RERC on Communication Enhancement 2011) in summarising the current status of research in this area argues that there is an urgent, unmet need for quality research and development to address the limited evidence currently available that ‘demonstrates the efficacy of mobile technologies and AAC Apps on the functional communication and quality of life of people with CCN’ (RERC on Communication Enhancement 2011: 4). The research reported in this next section responds to this gap in the literature through an investigation into the efficacy and benefits of using mainstream mobile technologies such as iPad tablet computers and associated applications to improve the communication experiences and social participation of people with disabilities.

Methodology

This research aims to investigate the efficacy and benefits of using mainstream mobile technologies such as iPad tablet computers and associated applications to improve the communication experiences and social participation of people with disabilities. The primary questions this research has sought to answer are:
• How effective are mainstream mobile devices such as iPad tablet computers and applications as assistive technologies?
• How do mainstream technologies facilitate the communication and social participation of those with complex communication needs?

**Research Design**

Ethics approval was obtained from the South Australian Government, Department for Communities and Social Inclusion and the University of South Australia Human Research Ethics Committee prior to commencement of the research.

The first stage of the research process involved a participatory approach in which two individuals with physical disabilities and complex communication needs (CCN) were recruited as co-researchers (both these co-researchers are co-authors of this paper). The co-researchers worked in conjunction with the research team’s Speech Pathologists to assess the efficacy and usability of the iPad devices and accompanying software. Through working with the two co-researchers, the team gained vital feedback on the initial pre-intervention assessment tools, the use of the hardware and software, and the issues and challenges of any additional equipment and processes.

The second stage of the research is still in progress and involves a trial of the iPad devices with 10 adult users who have varying disabilities and communication needs, in addition to complex health care needs, and who are living in a high support institution in South Australia (hereafter referred to as HSI). The participants’ skill attainment in using the iPad device and the efficacy of these devices in improving the participants’ communication and social interaction experiences is being tracked throughout the trial using a variety of different tools.

The methodology employed involves a mixed-methods approach incorporating:

1) Pre- and post-intervention measurements using the Canadian Occupational Performance Measurement (COPM) instrument designed to detect changes in self-perceived occupational performance over time (Law et al 2000).

2) Goal Attainment Scaling (GAS; Kiresuk, Smith & Cardillo 1994) in which each participant determines their own goals for the use of the iPads.

3) Analysis of social networks facilitated through the use of the iPads using the Circle of Communication Partners Paradigm (Blackstone & Hunt Berg 2003) and a modified version of the UCLA Loneliness Scale 2.0 (Russell 1996).

4) Recording of the participants’ use of the devices over a 12-month period (such as frequency of use, their choice of software applications and their interactions with others using the devices) via participant self-reporting.

5) Completion of a modified version of the Quebec User Evaluation of Satisfaction with Assistive Technology: (QUEST 2.0; Demers, Weiss-Iambrou & Ska 2002).

6) Completion of a computer/iPad skills inventory checklist developed by the researchers.

To date, five HSI participants in addition to the two participant co-researchers have been participating in the trial of iPad computers. Eligibility requirements include the capacity to manage the operation of an iPad (with appropriate modifications as required) and evidence of intentional communication. A further five participants will be recruited to the project in the next month and the lessons learned from the trials with the initial five participants will help to inform our approach to training and support for this next group of participants.

Each participant has been provided with an iPad tablet that they will be able to keep at the completion of project, as well as a pre-paid 3G Internet connection for 12 months. Access to the research team’s technical support assistant and therapist support has been available to participants should any issues arise during the trials.
Qualitative as well as quantitative information regarding each participant’s ability to manage each of the relevant skills required to access the iPad and associated apps is being recorded. Each participant has been encouraged to use a range of applications for communicative purposes, and the extent to which they do this independently is being documented. Since the ultimate aim of the trial has been to determine the usefulness of iPads in improving the communication and social networks of people with disabilities, the measurement tools selected for the research design focus on self-reported changes by the participants.

Following an initial meeting with each participant, during which the research assistant discussed the intended aims of the trial and gained their informed consent, pre-intervention assessment data was collected. Participants were reminded that even though they had given informed consent to participate, they are at liberty to withdraw at any stage and without any impact on their continuing services. Following pre-intervention assessment, participants were given training in using the iPad tablet computer and the software. The communication skills, abilities and satisfaction of the participants are being measured prior, during and after training. It was intended that the number and frequency of intervention sessions would be determined by the participants, however, our experience to date has shown that participants really need more frequent visits by research support staff than possible given the funding constraints.

Analysis

Since people with disabilities have unique characteristics that dictate the selection of assessment measures, the measures must be able to capture their individual needs, yet provide a standardised method to collect data to measure the effectiveness of the programs and allow for comparisons across groups. Using these criteria, the validated instruments described in the previous section have been utilised to measure the participants’ needs, goals, and aspects of communication including their social networks, occupational performance and satisfaction with the technology. Each participant has acted as their own control and pre- and post-intervention measures are providing an objective assessment of the efficacy based on each of these criteria for each participant.

Results

Since this paper is reporting on the interim findings from the project, the following section reports on the outcomes to date for the two participant co-researchers and five participants from the high support residential institution. The findings reported here focus on participants’ goals for using the iPad and apps, the training provided and progress to date, as well as their self-rating of their skills using the iPad and their satisfaction with the device.

Demographic details

The two participant co-researchers both have Cerebral Palsy and mild/moderate speech impairments associated with their physical disability. Both participant co-researchers are able to use the iPad via direct selection (i.e. the on-key keyboard) and both used text prediction software ‘Predictable’ (Therapy Box) to assist them with written communication.

The demographic details of the five HSI participants are shown in Table 1. As can be seen from Table 1, three of the five participants are male and two are female with ages ranging from 46 years to 86 years; the oldest participant has been a resident at HSI for 47 years.

Table 1 also shows participants’ communication needs and method of selection based on assessment using ‘Social networks: A communication inventory for individuals with complex communication needs and their communication partners-manual & Inventory Booklet’ (Blackstone & Hunt Berg 2003). Four of the participants use orthographic representation (alphabetic spelling system used in English language) as their primary means of communication. The one participant who has both a hearing impairment and intellectual...
disability uses a combination of orthographic representation and signing. Three of the participants have severe speech impairments; one has a moderate speech impairment and one a mild speech impairment. All but P1 who has ‘Locked in Syndrome’ (Quadriparesis) and uses scanning as his main method of access, are able to use direct selection via the on-screen keyboard.

<table>
<thead>
<tr>
<th>P</th>
<th>Age</th>
<th>Gender</th>
<th>Diagnosis</th>
<th>Receptive &amp; Expressive Language</th>
<th>Level of Speech Impairment</th>
<th>Representation Strategies Needed for Communication</th>
<th>Selection Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>60</td>
<td>Male</td>
<td>‘Locked in Syndrome’</td>
<td>Age Appropriate</td>
<td>Severe</td>
<td>Orthographic</td>
<td>Scanning</td>
</tr>
<tr>
<td>2</td>
<td>58</td>
<td>Male</td>
<td>Hearing Impairment and Intellectual disability</td>
<td>Severe Impairment</td>
<td>Severe</td>
<td>Sign plus some Orthographic</td>
<td>Direct</td>
</tr>
<tr>
<td>3</td>
<td>68</td>
<td>Female</td>
<td>Quadriplegic</td>
<td>Age Appropriate</td>
<td>Severe</td>
<td>Orthographic</td>
<td>Direct</td>
</tr>
<tr>
<td>4</td>
<td>86</td>
<td>Female</td>
<td>Cerebral Palsy</td>
<td>Age Appropriate</td>
<td>Moderate</td>
<td>Orthographic</td>
<td>Direct</td>
</tr>
<tr>
<td>5</td>
<td>46</td>
<td>Male</td>
<td>Acquired Brain Injury</td>
<td>Mild Impairment</td>
<td>Moderate</td>
<td>Orthographic</td>
<td>Direct</td>
</tr>
</tbody>
</table>

Table 1 – Demographic characteristics of participants

**Communication and Social Networks**

Information on communication and social networks was gathered using ‘Social Networks: A communication inventory for individuals with complex communication needs and their communication partners’ (Blackstone & Hunt Berg 2003), which provides information about each individual’s skills and abilities, modes of expression, representational strategies, selection techniques, and strategies that support interaction (comprehension and expression), as well as information about an individual’s Circles of Communication Partners (CCPs). This Social Network component of the instrument provides a visual representation of the individuals’ social network to identify partners in each circle: Circle 1 includes lifelong communication partners such as family and close relatives; Circle 2 includes good friends; Circle 3 includes acquaintances such as classmates and neighbours; Circle 4 includes paid workers such as teachers, doctors and specialists; Circle 5 includes unfamiliar partners such as shopkeepers, taxi drivers, and waiting staff; and Circle 6, which has been introduced as a new category of communication partners, includes online modes of communication such as social networking (eg Facebook), Skype and email (Raghavendra et al 2013).

Table 2 shows the number of CCPs for each participant at the time of pre-intervention assessment. It is apparent from Table 2 that most HSI participants have a limited number of communication partners in Circles 2-3 and 5-6, with most communication partners in Circle 4. This is not surprising since for HSI residents, Circle 4 includes HSI and agency nursing staff, and other allied health professionals. The limited number of communication partners in Circles 2-3 highlights one of the challenges referred to by McBride (2011), who suggests that a lack of availability and engagement with communication partners can undermine the outcomes of any intervention aimed at improving communication (McBride 2011).

PR1 has limited communication partners in the first three circles, but maintains an extensive number of communication partners in Circles 5 and 6 via email and phone. PR2 is well connected with a large number of communication partners in Circle 2, 3 and 6. This is not surprising given PR2 is an active member of a national disability organisation and maintains a strong network of communication with friends, colleagues and professionals via email and Facebook.
Participant | CCP1 | CCP2 | CCP3 | CCP4 | CCP5 | CCP 6 |
--- | --- | --- | --- | --- | --- | --- |
P1 | 6 | 4 | 4 | 66 | 1 | 0 |
P2 | 2 | 5 | 1 | 60 | 0 | 0 |
P3 | 3 | 1 | 3 | 56 | 0 | 5 |
P4 | 2 | 5 | 4 | 56 | 1 | 0 |
P5 | 5 | 1 | 2 | 45 | 0 | 0 |
PR1 | 7 | 0 | 2 | 28 | 10 | 16 |
PR2 | 2 | 39 | 81 | 7 | 6 | 41 |

Table 2 – Number of CCPs for each participant at pre-intervention assessment

**Canadian Occupational Performance Measurement (COPM)**

Each participant’s occupational performance and satisfaction (in relation to communication and iPad use) was assessed prior to intervention using the Canadian Occupational Performance Measurement (COPM) instrument, which is designed to detect changes in self-perceived occupational performance over time (Law et al 2000). The COPM is completed through a semi-structured interview with the researcher and a structured scoring method. The participants were asked to rate both their current level of performance and satisfaction on scales of 1 to 10 (where 1 = not able to do it, not satisfied at all; and 10 = able to do it extremely well, extremely satisfied). This assessment helped to determine the goals established for each of the participants. It should be noted that although all three areas of occupational performance identified in the COPM were discussed with participants (ie. self-care, productivity and leisure) there was a specific focus on communication or iPad use within this process.

Table 3 reports the outcomes of COPM assessment at pre-intervention, showing each participant’s areas of concern, their level of performance and their satisfaction with performance.
Table 3 – Participants’ level of occupational performance and satisfaction with performance prior to intervention

One interesting observation from the data reported in Table 3 is that some participants listed certain COPM activities as areas of concern even though they rated these activities as high in both performance and satisfaction. This finding may suggest that the identified activities are areas of importance to participants and that they included them as activities they wanted to continue to pursue with their iPad devices. However, it might also indicate a level of confusion among some participants about the rating system employed. In most cases the self-rating of performance and level of satisfaction expressed by participants are consistent (ie both performance and satisfaction rated as low), however, Table 3 shows that there are a few COPM activities listed by participants that they rated as low in performance, yet high in satisfaction. A finding that is discussed in further detail in the discussion section of this paper.

**Intervention Strategies**

Intervention has been based on the outcomes of pre-intervention assessment as well as the strategies required for each participant to achieve their stated goals. Visits from research team members have occurred on a weekly basis over a three month period. During these sessions, a variety of activities have been undertaken with iPads and appropriate apps, including exploring a range of alternative input methods (such as a head pointer for P1 – see Figure 1), mounting on wheelchair, selection of and training in the use of apps and problem-solving difficulties with apps (such as accessing the Internet, removing ‘friends’ from Facebook), putting short-cuts to apps on the home screen, and demonstrating/finding additional apps that were both appealing and useable by participants. One participant (P4) has explored using the iPad to take photos of the flowers she is growing on the balcony and then using a jigsaw app to transform the photos she has taken into jigsaw puzzles.
Interim Findings

At the time of writing this paper, only one participant co-researcher (PR2) had completed the trial of her iPad, thus only interim observations can be reported. Post-intervention testing will be conducted mid-year at which time it will be possible to determine whether participant goals have been met and the extent to which access to the iPad device, apps and ongoing training and support has made a difference to the communication and social participation of those with complex communication needs (research question 2). The observations reported here do, however, highlight some of the challenges foreshadowed in the literature review and also go some way to exploring the answer to the first research question concerning the efficacy of mainstream mobile devices as assistive technologies.

Participant Goals

Table 4 shows the participants’ goals that were informed by pre-intervention assessment using the COPM and their progress towards achieving these goals is reflected in the second column via notes made from research assistant observations. Interestingly, both participant co-researchers re-prioritised some goals and added new goals subsequent to the COPM assessment as some goals were met and other needs arose.
<table>
<thead>
<tr>
<th>Participant</th>
<th>Goal</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>P1</td>
<td>To be able to speak independently using the iPad</td>
<td>Would need to gain better control of head pointer to use ‘Predictable’ more efficiently. The lack of an appropriate key guard for the latest version of ‘Predictable’ as well as limitations with the software has resulted in the decision to seek alternative solutions such as eye gaze with alternative software using either Android or Windows 8 technology. The difficulty of moving between applications was also a noted as a cause of concern with the iPad.</td>
</tr>
<tr>
<td></td>
<td>Independently read The Australian</td>
<td>Is making progress on this, but has difficulty dealing with pop-up advertisements in apps and controlling page.</td>
</tr>
<tr>
<td></td>
<td>Access to games, internet</td>
<td>Difficulty in finding accessible apps.</td>
</tr>
<tr>
<td></td>
<td>Will be able to use the iPad in other positions (such as bed)</td>
<td>HSI staff have agreed to assist P1 in achieving this goal.</td>
</tr>
<tr>
<td>P2</td>
<td>Talk about experiences and events</td>
<td>P2 is able to select pictures within the ‘Evernote’ app and adds signs and gestures to expand the message. His support workers need some practice (training has been provided) to continue at this level but already achieved this several times within the project sessions.</td>
</tr>
<tr>
<td></td>
<td>Be able to tell others what he wants</td>
<td>P2 has not yet had enough practice with the device to use it for this purpose. Intellectual disability and short concentration span limit what can be achieved in a session, making progress slow.</td>
</tr>
<tr>
<td></td>
<td>Able to tell jokes</td>
<td>This goal has not been addressed as yet.</td>
</tr>
<tr>
<td></td>
<td>Direct others about his care</td>
<td>This goal has not been addressed as yet. He has established methods of communicating with staff (gestures and pointing) and does not appear to want to change this.</td>
</tr>
<tr>
<td></td>
<td>Contacting others for events</td>
<td>This goal has not been addressed as yet.</td>
</tr>
<tr>
<td>P3</td>
<td>Able to chat and stay in touch with her friends and family via email and Facebook whenever she chooses</td>
<td>Beginning to use the iPad for this purpose using this effectively now. Distressed by a hoax email purporting to be from friend.</td>
</tr>
<tr>
<td></td>
<td>Able to read what she wants when she wants</td>
<td>P3 does not seem as interested in this goal at present has downloaded several books and has started to read them. Also downloaded music from iTunes. She is now set up with her own iTunes account and she is slowly becoming confident with this.</td>
</tr>
<tr>
<td></td>
<td>Share stories about past and present with others (face to face or online)</td>
<td>P3 is able to do this, but does not seem motivated to store chunks of text due to limited number of conversation partners available to her.</td>
</tr>
<tr>
<td></td>
<td>Have the means and opportunity to correct people when they mispronounce her name, and will be able to explain the importance of this</td>
<td>P3 has a message saved, but is unsure if she feels confident to use it at this point in time.</td>
</tr>
<tr>
<td></td>
<td>Ability to share messages efficiently with staff at HSI</td>
<td>Does not seem interested at present to use the iPad to talk to staff mainly because HIS staff still tend to use her old communication board when communicating with her and she does not take the iPad when out of her room. She has, however, used the iPad to communicate with her doctor.</td>
</tr>
<tr>
<td>P3 cont</td>
<td>Goal</td>
<td>Comments</td>
</tr>
<tr>
<td>---------</td>
<td>------</td>
<td>----------</td>
</tr>
<tr>
<td>Use the phone for social calls with friends</td>
<td>We have not had the opportunity to address this goal to date.</td>
<td></td>
</tr>
<tr>
<td>Use the iPad for greater access to puzzles, games and interaction</td>
<td>P3 has enjoyed playing games and may choose to use more in the future. She has experimented with creating her own jig-saw puzzles from photos she takes of flowers in her balcony garden.</td>
<td></td>
</tr>
<tr>
<td>Use the iPad for greater access to puzzles, games and interaction</td>
<td>P4 has been set up and trained to achieve this goal, but has not had the opportunity, confidence or will to use it with staff as yet.</td>
<td></td>
</tr>
<tr>
<td>Send greeting cards to friends and family</td>
<td>P4 would like to do this and has the set up to do so, but needs more support and time to practice sending cards.</td>
<td></td>
</tr>
<tr>
<td>Play cards and interact with opponents online</td>
<td>Some new games have been introduced, but P4 has not yet participated in online games.</td>
<td></td>
</tr>
<tr>
<td>Read what she wants when she wants to.</td>
<td>P4 has been slow to take this up, but does read church website and received daily emails from church website.</td>
<td></td>
</tr>
<tr>
<td>Write letters or email to friends</td>
<td>P4 has achieved this goal and also sent messages to researchers, but does not have a listing of email addresses from others to allow further email partners as yet. Small icons on email and lack of correct key guard for latest version of ‘Predictable’ make typing difficult (due to ataxia). External keyboard (larger than iPad with QWETY layout and full size keys) has been provided to help P4 improve typing, but still has difficulty using email due to insufficient coordination to manage icons on iPad screen.</td>
<td></td>
</tr>
<tr>
<td>Use the iPad for greater access to puzzles, games and interaction.</td>
<td>P4 has not tried other puzzles yet, just card games, but is keen to explore further options has now tried ‘Bingo’, ‘Connect 4’, ‘Hangman’, and continues to do so.</td>
<td></td>
</tr>
<tr>
<td>Use the internet as a source of leisure time reading/exploration</td>
<td>P4 has not yet explored the internet options available, but will be working toward achieving this goal.</td>
<td></td>
</tr>
<tr>
<td>P5</td>
<td>Goal</td>
<td>Comments</td>
</tr>
<tr>
<td>Keep up with current affairs and news</td>
<td>Two HSI staff have been trained and will try using the internet with P5 given his limited number of online communication partners.</td>
<td></td>
</tr>
<tr>
<td>Talk intelligibly and efficiently</td>
<td>On his way to achieving this goal, but needs practice for access and scanning as well as opportunity to use it and familiarise himself more.</td>
<td></td>
</tr>
<tr>
<td>Create drawings and paintings</td>
<td>P5 is on his way to achieving this goal, but needs practice for access and opportunity.</td>
<td></td>
</tr>
<tr>
<td>Play board games</td>
<td>Goal not yet addressed.</td>
<td></td>
</tr>
<tr>
<td>Use the iPad to write stories and share them with others.</td>
<td>P3 needs practice for access and scanning to achieve this goal.</td>
<td></td>
</tr>
<tr>
<td>Will be able to direct where he goes when he is being pushed around by others</td>
<td>Goal not yet addressed. Deterioration in hand mobility due to change in wheelchair has severely restricted progress. Investigating eyegaze hardware/software solutions.</td>
<td></td>
</tr>
</tbody>
</table>
The benefits and challenges in using mainstream devices as assistive technologies for people with disabilities

PR1: Write text effectively and more quickly
Will try ‘Predictable’.

Efficient way to write book
Explore ways of using iPad and computer together.

Use text messaging
To get messages to people more quickly

Interact socially online
Consider stored messages that can have minor alterations to personalise.

PR2: Dealing with patronising people
Did not think to use iPad at the time.

Giving presentations to groups
Has made a big difference to delivering presentations.

To share information that will put people at ease when talking
Works well in noisy/crowded places.

Efficient means of text entry
Using ‘Speak It’ and ‘Predictable’ apps efficiently.

Table 4 – Participants’ goals based on pre-intervention assessment of occupational performance and satisfaction

Table 5 reports the interim rating of the iPad device by three HSI participants and the two participant co-researchers using a modified version of the Quebec User Evaluation of Satisfaction with Assistive Technology (QUEST 2.0; Demers, Weiss-Iambrou & Ska 2002). Using QUEST 2.0 participants rated a series of features of the iPad on a scale from 1 (low satisfaction) to 5 (high satisfaction). At the time of writing, Participants 2 and 5 (P2 and P5) had not had enough experience to be able to assess their satisfaction with the iPad device.

<table>
<thead>
<tr>
<th>iPad Features</th>
<th>P1</th>
<th>P3</th>
<th>P4</th>
<th>PR1</th>
<th>PR2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Satisfaction with the dimension (size, height, length, width) of assistive device</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Satisfaction with the weight of assistive device</td>
<td>NA</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Satisfaction with ease in adjusting (fixing, fastening) the parts of assistive device</td>
<td>4</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>NA</td>
</tr>
<tr>
<td>Satisfaction with the safety and security of assistive device</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Satisfaction with the durability of assistive device</td>
<td>NA</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>2</td>
</tr>
<tr>
<td>Satisfaction with the simplicity to use assistive device</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Satisfaction with the comfort level of assistive device</td>
<td>NA</td>
<td>5</td>
<td>5</td>
<td>3</td>
<td>5</td>
</tr>
</tbody>
</table>
Table 5 – Participants’ responses to the Quebec Evaluation of Satisfaction with Assistive Technology (2.0)

As shown in Table 5, most participants rated their satisfaction with the size and dimensions, weight and ability to adjust set-up as either 4 or 5. Most participants were also satisfied or very satisfied with the safety and security of the device, with the exception of P1 who relies on HSI staff to store his iPad safely in between sessions, and as a result, is often without access to the device between intervention sessions. Most participants were also very satisfied with the durability of the device except participant co-researcher 2 who uses her iPad as a mobile technology and had to have the device repaired when she accidentally dropped it on one occasion. Some participants reported a high level of satisfaction with the comfort and effectiveness of the device, though three rated the simplicity of use as neutral or not very satisfied, indicating the need for further training in the use of the device and associated apps.

All HSI participants had difficulties with physical access to the iPads as their iPads were kept locked in cupboards or drawers for security reasons. This meant that the devices were not accessible to P1 and P5 in between intervention sessions and caused some difficulties for P2 and P3. P1 and P5 were thus not able to practice with their iPads unless a member of the research team was there to set them up. This problem was partially addressed by providing training to nurses and ward staff to set up the iPads. However, rapid staff turnover, staff shortages and the use of agency staff on a regular basis complicated the situation. The same problem occurred with charging the iPad between uses as assistance was required from nursing staff or visitors. One effective strategy employed was to incorporate routines for iPad set-up, charging and pack-up to be incorporated into daily nursing plans, so that they were not overlooked. Along similar lines, putting research team visits into the daily plan for the participant was effective in ensuring that the participant was available at the time of the visit.

Changes to participant routines outside the scope of the trials occasionally resulted in the need for modifications to be made for the iPad set up. For example, P5 required a new wheelchair, which resulted in changes in his posture. This then made access to the iPad (and other communication devices) difficult as the movement in his hand became more restricted. Thus addressing one problem (perhaps pressure areas or discomfort in existing chair) resulted in implications for other issues, eg communication. Very limited availability of therapists (speech, occupational and physiotherapy) made altering the participant posture or routines a time-consuming process.

Most participants rated their satisfaction with delivery and setup and the training provided as neutral, quite satisfied or very satisfied, but HSI participant satisfaction with the support available to them between sessions was much lower than for all other criteria. HSI participants were generally willing to engage in trial and error experimenting with their iPads, but as noted above, P1 and P5 expressed frustration at their reliance on HSI staff to set them up with the iPad each day. The title for this paper reflects this overall observation in the words of P5 who on one visit stated ‘if you leave it (the problem) with me…I will work it out’. Likewise P1 was keen to ‘suck it and see’ with various modifications to enable him to access the iPad.
The interim findings to date also highlight the importance of having carers engaged in initial communication. For some this was a family member, while for others, support was provided by visitors from churches or community organisations. Activities that participants wished to undertake included reading e-books, email, making and sending greeting cards, drawing, writing stories reading the newspaper and communicating with others. Most participants were keen to learn more about the use of the iPad, wanting time to explore different applications to see which suited them best. As Tables 3 and 4 show, many participants were interested in exploring the use of their iPad for online interaction with friends and P3 was very keen to use social media (Facebook), and at the time of the writing of this paper, was able to practice using both Facebook and email independently. However, the achievement of such goals was severely limited for most participants by their limited contact with regular communication partners in Circles 2-3.

Another finding from the trials thus far indicates a level of complacency among long-term HSI residents, with some participants rating their performance on particular COPM activities much lower than their satisfaction with their performance. This finding, together with the observation that one participant was reluctant to use her iPad to direct staff even though she now has the ability to do so, may be a reflection of a sense of ‘learned helplessness’ (Deci & Ryan 1985) resulting from a perceived lack of control over their circumstances. This level of complacency and acceptance of the status quo may be a factor limiting the goals and aspirations of some of our participants.

The research also highlighted issues and limitations with some of the apps chosen for use by participants. For example, some apps (newspapers and games) had pop-up advertisements that were very difficult for participants to close, requiring two clicks on opposite sides of the screen. Similarly, several issues were identified when participants began using other specialised AAC apps and the research team liaised with app writers, requesting modifications be incorporated in subsequent versions of the app. There were some strategies that helped participants, such as removing excess app icons from the home screen (to a later page) making it easier for participants to select their chosen app.

Discussion and Conclusion

The research reported in this paper, though still in progress, has already highlighted both the benefits of mainstream mobile devices such as iPads as well as the challenges in their use as assistive technologies. Consistent with the literature, our experience to date demonstrates the benefits of the affordability and ‘normalcy’ of these devices as well as multifunctional features enabling participants to pursue a range of activities including communicating with others, social networking, leisure (playing games and reading newspapers) and accessing information via the web. However, as the authors cited in the literature review caution, our research has also revealed several challenges that need to be addressed to ensure participants can benefit from such technologies.

Some of these challenges we had anticipated, for example the need for adequate assessment and ‘features matching’ for each participant, the time that would be required to provide training in the use of the iPad and associated apps, as well as the need to explore a range of alternative input methods and tablet hardware/software platforms (such as Android and Windows 8) for those with more complex needs. We also anticipated that for those with complex communication needs, the availability of communication partners would impact in their ability to gain from the potential of the devices as communication aids. Our research with long-term residents of a high support institution for people with disabilities also revealed a range of other challenges that need to be addressed for people who have limited social networks and lowered aspirations.

Another limiting factor impacting on the speed at which participants have been able to acquire the skills required to achieve their goals has been the lack of support in between the research team’s weekly visits. While the team have trained various HSI staff to support participants in
the interim days between visits, the large number of staff that participants come in contact with, combined with a rapid turnover of staff, has made continuity of support challenging.

We were encouraged by the willingness of participants to persevere in trying out different approaches to using their iPads, despite the effort involved and learning curve associated with mastering their chosen apps. However, as the quote reflected in the title of this paper suggests, while participants were all too ready to ‘work it out’ themselves, they rely on carers to set them up with their device each day. This requires a commitment by carers to be available to assist in this way, as well as adequate training of carers to ensure they have the confidence and skill required.

This paper has reported interim findings from trials of iPads with two participant co-researchers and five residents of a high support institution, and therefore the analysis is limited by the small number of participants whose experiences have been reported as well as the limited outcomes achieved by those participants so early in the project. Despite these limitations, the findings reinforce many of the concerns reported in the literature review and point to the value of research such as this study, which aims to explore strategies for improving the longer-term outcomes for people with disabilities using mainstream mobile devices as assistive technologies.

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Endnotes

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2. UK company Therapy Box provided ‘Scene and Heard’ and ‘Predictable’ apps for use with participants as well as invaluable technical advice throughout the project.

3. Zyteq Pty Ltd offered provided much needed advice and support in selection and trial of a range of switches, connectors and iPad accessories for use in the project.

4. Special thanks also to Paul Willey, Nancy Rogers, Krystyna Slowinski and Dawn Jennifer from the Department for Communities and Social Inclusion for their ongoing guidance regarding ethical considerations undertaking this research.

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Dignity, diversity and democracy through inclusive design
Designing an accessible website for ‘Dignity for Disability’

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Charles Morris
University of South Australia and Metadas Media
Darren Candler
Metadas Media

Increasing access to Information and Communication Technologies, and a growing awareness of the role that the Internet plays in enabling participation in the democratic process has highlighted the importance of ensuring that all government and parliamentary websites are accessible to all Australians. The United Nations Convention on the Rights of Persons with Disabilities, of which the Australian Government is a signatory, recognises the role that web accessibility plays in a democratic society through Article 9 focusing on accessibility and Article 29, which protects the right of people with disability to participate in political and public life. However, the review of major Australian political party websites reported in this paper reveals a mismatch between Australia’s commitment to accessibility and the reality. This paper reports the findings of the review and presents a case study on the redesign of the Dignity for Disability website as a roadmap for web developers on practical strategies for redesigning websites to meet international web accessibility guidelines.

Introduction

Online Information and Communication Technologies (ICTs) make accessing information any time, any place and using any device a reality for more than a third of the world’s population (Wood 2010). Recent figures on Internet usage suggest that in June 2012 more than 34% of the global population had access to the Internet and of that global population, more than 24 million users are located in Oceania / Australia (67% penetration) (World Internet Users Statistics 2012). The number of users with access to high speed broadband is also set to increase as Australia’s strategy for the national broadband network (NBN) is implemented. As Budde and McNamara (2012) suggest, the impact of increasing high speed internet access in Australia is likely to have profound economic and social impact, and has the potential to enhance participation in the democratic process. These changes also highlight the importance of ensuring that all government and parliamentary websites are accessible to all Australians.

This paper reports the findings of a review of three major political party websites, and presents a case study on the redesign of the Dignity for Disability (D4D) website to meet international Web accessibility guidelines. The paper provides a roadmap for web developers on practical strategies for redesigning websites to ensure they are accessible to a diverse user population. The background section of this paper provides a review of the relevant literature relating to the Australian Government’s responsibilities as a signatory of the United Nations Convention on the Rights of Persons with Disabilities (UNCRPD). The review also describes the World Wide Web Consortium’s (W3C) Web Content Accessibility Guidelines (WCAG
2.0) and Authoring Tool Guidelines (ATAG 2.0), and the relevance for Australian web developers. The Australian Government’s commitment to ensuring all government (.gov) websites meet WCAG 2.0 Level AA compliance by 2014 through its National Transition Strategy is described and the implications for increasing the democratic participation of people with disabilities is discussed. The failure of major political party websites to meet these benchmarks is explored and the redesign of the D4D website is presented as a case study demonstrating the practical strategies involved in redesigning a website to meet W3C WCAG 2.0 Level AA compliance. The final sections of the paper explore the implications for increasing the participation of people with disabilities through ‘cyber-democracy’.

Background

The importance of access to information and services to enable active participation in political and public life is reflected in Articles 9 and 29 in the Declaration on the Rights of Persons with Disabilities, which was proclaimed by the General Assembly of the United Nations on 9 December 1975. Australia was the first Western country to ratify the convention in July 2008 and there are now 155 signatories to the Convention (UN Convention on the Rights of Persons with Disabilities: Status of Signatories and Parties 2013). The relevant Articles of interest to the study reported in this paper are discussed in the following section.

UN Convention on the Rights of Persons with Disabilities

Article 1 of the UN Convention on the Rights of Persons with Disabilities (UNCRPD) states:

The purpose of the Convention is to promote, protect and ensure the full and equal enjoyment of all human rights and fundamental freedoms by all persons with disabilities, and to promote respect for their inherent dignity.

The principles set out in Article 3 provide guidance for understanding and interpreting the UNCRPD and include the rights of people with disabilities to: a) Respect for inherent dignity, individual autonomy including the freedom to make one’s own choices, and independence of persons; b) Non-discrimination; c) Full and effective participation and inclusion in society; d) Respect for difference and acceptance of persons with disabilities as part of human diversity and humanity; e) Equality of opportunity; f) Accessibility; g) Equality between men and women; h) Respect for the evolving capacities of children with disabilities and respect for the right of children with disabilities to preserve their identities.

Article 9 makes specific reference to the fundamental human right for people with disabilities to be able to live independently and participate fully in all aspects of life. Article 9 further notes that States Parties shall therefore,

- take appropriate measures to ensure to persons with disabilities access, on an equal basis with others, to the physical environment, to transportation, to information and communications, including information and communications technologies and systems, and to other facilities and services open or provided to the public, both in urban and in rural areas.

Article 9 also outlines the steps required to achieve these accessibility goals, advising:

States Parties must take appropriate measures to:

- Develop, promulgate and monitor the implementation of minimum standards and guidelines for the accessibility of facilities and services open or provided to the public;
- Ensure that private entities that offer facilities and services which are open or provided to the public take into account all aspects of accessibility for persons with disabilities;
- Provide training for stakeholders on accessibility issues facing persons with disabilities;
d) Provide in buildings and other facilities open to the public signage in Braille and in easy to read and understand forms;

e) Provide forms of live assistance and intermediaries, including guides, readers and professional sign language interpreters, to facilitate accessibility to buildings and other facilities open to the public;

f) Promote other appropriate forms of assistance and support to persons with disabilities to ensure their access to information;

g) Promote access for persons with disabilities to new information and communications technologies and systems, including the Internet; and

h) Promote the design, development, production and distribution of accessible information and communications technologies and systems at an early stage, so that these technologies and systems become accessible at minimum cost.

Article 29 is concerned with the right of persons with disabilities to participation in political and public life and is of particular relevance to the study reported in this paper. Article 29 articulates that States Parties have a responsibility to ensure that persons with disabilities have equal political rights and the opportunity to enjoy them on an equal basis with others.

This includes the right and opportunity for persons with disabilities to vote and be elected by:

a) Ensuring that voting procedures, facilities and materials are appropriate, accessible and easy to understand and use;

b) Protecting the right of persons with disabilities to vote by secret ballot in elections and public referendums without intimidation, and to stand for elections;

c) Guaranteeing the free expression of the will of persons with disabilities as electors and to this end, where necessary, at their request, allowing assistance in voting by a person of their own choice;

d) Promoting an environment in which persons with disabilities can effectively and fully participate in the conduct of public affairs, without discrimination and on an equal basis with others, and encourage their participation in public affairs.

It is clear from these two UNCRPD Articles that all Governments, especially those which are signatories of the UNCRPD, are obligated to ensure that all websites are accessible. Accessibility is of particular importance to government and political party websites, which provide a valuable conduit through which people with disabilities gain access to the information and services they require to exercise their right to participate in political and public life. One way in which this goal can be achieved is through the adoption of policies designed to ensure that all public websites are compliant with internationally agreed upon web accessibility guidelines. In the next sections of this paper we describe the World Wide Web Consortium’s (W3C) Web Content Accessibility Guidelines 2.0 (WCAG 2.0) and the draft Authoring Tool Accessibility Guidelines 2.0 (ATAG 2.0), which provide a foundation for guiding developers of websites as well as the developers of the authoring tools employed in the design of websites.

Web Content Accessibility Guidelines (WCAG 2.0)

The release of the W3C Web Accessibility Guidelines (WCAG 1.0) in 1999 led to a new focus on addressing Web accessibility issues based on an inclusive or universal design approach. These W3C guidelines provide designers with the means for ensuring that the websites they create are accessible to a broad range of users, including those with vision impairments, hearing impairments, mobility impairments and learning disabilities. The
updated Web Content Accessibility Guidelines (WCAG 2.0) became an official W3C standard in 2008.

WCAG 2.0 guidelines are based on a ‘technology-neutral’ perspective and can be more readily applied to new and emerging technologies such as Web 2.0, cloud computing, augmented and gesture based interfaces and mobile devices. There are four overarching WCAG 2.0 design principles. Online content must be:

1) *Perceivable* (ie information and user interface components must be presentable to users in ways they can perceive);
2) *Operable* (user interface components and navigation must be operable);
3) *Understandable* (information and the operation of user interface must be understandable); and
4) *Robust* (content must be robust enough that it can be interpreted reliably by a wide variety of user agents, including assistive technologies).

Under each of these overarching principles are twelve guidelines that further clarify the purpose of each principle. Each guideline has a number of success criteria, which provide a means for checking conformance to each guideline. Both WCAG 1.0 and 2.0 employ a three-level rating system to identify the level of accessibility. The four WCAG 2.0 principles and associated guidelines are as follows:

1. **Perceivable**
   
   1.1 Provide text alternatives for any non-text content so that it can be changed into other forms people need, such as large print, braille, speech, symbols or simpler language.
   
   1.2 Provide alternatives for time-based media.
   
   1.3 Create content that can be presented in different ways (for example simpler layout) without losing information or structure.
   
   1.4 Make it easier for users to see and hear content including separating foreground from background.

2. **Operable**
   
   2.1 Make all functionality available from a keyboard.
   
   2.2 Provide users enough time to read and use content.
   
   2.3 Do not design content in a way that is known to cause seizures.
   
   2.4 Provide ways to help users navigate, find content, and determine where they are.

3. **Understandable**
   
   3.1 Make text content readable and understandable.
   
   3.2 Make Web pages appear and operate in predictable ways.
   
   3.3 Help users avoid and correct mistakes.

4. **Robust**
   
   4.1 Maximize compatibility with current and future user agents, including assistive technologies.

**Authoring Tool Accessibility Guidelines (ATAG 2.0)**

The W3C’s working draft of the Authoring Tool Accessibility Guidelines version 2.0 includes recommendations for assisting authoring tool developers to make their authoring tools more accessible to people with disabilities. Authoring tools include Content Management Systems (CMS), which are typically used in large organisations to make it easier for employees to
maintain the corporate website without requiring specific web design skills, as well as fit-for-purpose web design software applications, such as Adobe Dreamweaver.

ATAG 2.0 addresses two user groups with disabilities: A) Authors of web content, whose needs are met by ensuring that authoring tool user interfaces are more accessible (Part A); and B) End users of web content, whose needs are met through the production of accessible content using compliant authoring tools (WCAG) (Part B).

Each of these ATAG 2.0 sections have associated high-level principles that organise the guidelines and articulate the basic goals that authoring tool developers should achieve to make authoring tools more accessible to both authors and end users of web content. Each ATAG 2.0 guideline also includes a rationale for the guideline and testable success criteria. As with WCAG 2.0, ATAG 2.0 provides for multiple levels of conformance: Level A (lowest), AA (middle), AAA (highest).

The two ATAG parts and associated principles and guidelines are as follows:

**A. Make the authoring tool user interface accessible**

A.1. Authoring tool user interfaces must follow applicable accessibility guidelines
   A.1.1. (For the authoring tool user interface) Ensure that web-based functionality is accessible
   A.1.2. (For the authoring tool user interface) Ensure that non-web-based functionality is accessible

A.2. Editing-views must be perceivable
   A.2.1. (For the authoring tool user interface) Make alternative content available to authors
   A.2.2. (For the authoring tool user interface) Editing-view presentation can be programmatically determined

A.3. Editing-views must be operable
   A.3.1. (For the authoring tool user interface) Provide keyboard access to authoring features
   A.3.2. (For the authoring tool user interface) Provide authors with enough time
   A.3.3. (For the authoring tool user interface) Help authors avoid flashing that could cause seizures
   A.3.4. (For the authoring tool user interface) Enhance navigation and editing via content structure
   A.3.5. (For the authoring tool user interface) Provide text search of the content
   A.3.6. (For the authoring tool user interface) Manage preference settings
   A.3.7. (For the authoring tool user interface) Ensure that previews are at least as accessible as in-market user agents

A.4. Editing-views must be understandable
   A.4.1. (For the authoring tool user interface) Help authors avoid and correct mistakes
   A.4.2. (For the authoring tool user interface) Document the user interface including all accessibility features

**B. Support the production of accessible content**

B.1. Fully automatic processes must produce accessible content
   B.1.1. Ensure automatically specified content is accessible
   B.1.2. Ensure accessibility information is preserved

B.2. Authors must be supported in producing accessible content
B.2.1. Ensure accessible content production is possible
B.2.2. Guide authors to produce accessible content
B.2.3. Assist authors with managing alternative content for non-text content
B.2.4. Assist authors with accessible templates
B.2.5. Assist authors with accessible pre-authored content

B.3. Authors must be supported in improving the accessibility of existing content
B.3.1. Assist authors in checking for accessibility problems
B.3.2. Assist authors in repairing accessibility problems

B.4. Authoring tools must promote and integrate their accessibility features
B.4.1. Ensure the availability of features that support the production of accessible content
B.4.2. Ensure that documentation promotes the production of accessible content

Australian Government’s Web Accessibility National Transition Strategy

The Web Accessibility National Transition Strategy (NTS, Web Accessibility National Transition Strategy 2010) was established to provide a formal process by which the Australian Government can improve the accessibility of its websites to better engage with the public through the use of an increasing number of Web 2.0 technologies. While the implementation of W3C WCAG 2.0 is not a new initiative for the Australian Government, the NTS is regarded as a major milestone in the Government’s whole of government approach to implementing its web accessibility policies.

Under the direction of the Australian Government Information Management Office (AGIMO), which is part of the Department of Finance and Deregulation, a whole-of-government strategy for federal government websites for transition to WCAG 2.0 has been implemented. This transition involves three phases:

1) Preparation Phase – July 2010 to December 2010;
2) Transition Phase – January 2011 to December 2011; and
3) Implementation Phase – Completed by December 2012 (Single A) and December 2014 (Double A).

AGIMO is also leading a cross-jurisdictional project designed to oversee the implementation of WCAG 2.0 ‘in a unified, consistent and cost-effective manner’ (Web Accessibility National Transition Strategy 2010). While the NTS focuses on WCAG 2.0 compliance, it is essential that the accessibility of authoring tools used within government departments meet ATAG 2.0 guidelines to enable employees with disabilities to update the site easily, and to ensure that the sites generated are accessible to end users.

According to the NTS website, WCAG 2.0 is ‘applicable to all online government information and services’ including external (public-facing or private) and internal (closed community) sites. Less clear, is whether the NTS applies to government related, non.gov domain sites, such as political party websites. This is a similar dilemma to that reported by Nomensa in its article ‘If accessibility got the deciding vote’ (2011), which noted that while the Central Office of Information (COI) in the UK specifies WCAG level AA as the minimum standard expected of all public sector websites, ‘it is debatable whether the political parties are public sector and are therefore expected to have websites that conform to the COI guidelines’ since none of the political party websites have.gov.uk domains. However, as the Nomensa article’s author points out, regardless of legislation, the three main political parties ‘should be leading by example, ensuring that their websites are accessible to as many people as possible’. 
This section has reviewed the UNCRPD focusing on Articles 9 and 29, which make it clear that the Australian Government as a signatory to the UNCRPD has an obligation to ensure all websites, including the websites of political parties, are accessible to enable people with disabilities to more fully participate in political and public life. The Australian Government through its National Transition Strategy has set a benchmark for achieving a minimum level of WCAG 2.0 Level AA compliance by the end of 2014, but how do the political party websites stack up against these standards? The following section sets out to answer this question through a review of three major Australian political party Websites; The Australian Labour Party (http://www.alp.org.au); The Australian Liberal Party (http://www.liberal.org.au); and The Greens (http://greens.org.au).

**Review of major Australian political party websites**

As noted above, the websites of three major Australian political parties were reviewed against W3C WCAG 2.0 to determine their level of conformance. The review involved checking the validity of the HTML/XHTML and CSS coding of the websites using the W3C validation tools, testing the sites using semi-automated tools including SortSite, Cynthia Says and WAVE, and manual checking of features not easily tested using semi-automated tools.

Table 1 summarises the accessibility issues identified from a review of a representative sample of 25 pages from each site.

<table>
<thead>
<tr>
<th>WCAG 2.0 Guidelines</th>
<th>Labour Party</th>
<th>Liberal Party</th>
<th>The Greens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level A compliance issues</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide text alternatives</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Provide appropriate mark-up for all forms</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Provide alternative content for iframe elements</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Include title attributes for all frames</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Provide a means for skipping navigation links</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Ensure Flash movie is accessible</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>All ONCLICK handlers should have an equivalent ONKEYPRESS handler</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Tab order must follow logical sequence</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Ensure all PDF documents are accessible and include a link to Acrobat Reader</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Avoid duplicate IDs</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Include a TITLE attribute for MAP elements</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
<tr>
<td>Identify row and column headers in tables</td>
<td>❌</td>
<td>❌</td>
<td>❌</td>
</tr>
</tbody>
</table>
Level AA compliance issues

| Create pages that validate to W3C recommendations | ❌ | ❌ | ❌ |
| Avoid specifying a new window                     | ❌ | ❌ | ❌ |
| Do not use generic link text like "Click Here" or "Read More" | ❌ | ❌ | ❌ |
| Ensure headings are nested correctly             | ❌ | ❌ | ❌ |
| Ensure all links using same link text point to same direction | ❌ | ❌ | ❌ |
| Ensure that foreground and background colours have enough contrast | ❌ | ❌ | ❌ |
| Use relative rather than absolute units in CSS property values. | ❌ | ❌ | ❌ |

Level AAA compliance issues

| Provide summary attributes for data tables | ❌ |

Table 1 – Conformance issues identified in a review of three major Australian political party websites

As Table 1 shows, the review identified several Level A and Level AA conformance issues including accessibility problems that would preclude a large number of users with disabilities, yet are relatively easy to address (for example, adding alternative text to images, including labels and id attributes for forms, specifying a logical tab order for forms, including appropriate mark up for tables such as headers and summary attributes). The Labour Party website also employs Flash and iframes, which add to the accessibility issues encountered by users with disabilities.

Case study: The redesign of the Dignity for Disability Website

The review reported in the preceding section identifies significant accessibility issues for all three major Australian political party websites. As noted above, the compliance issues identified above are easily resolved, but failure to address the numerous Level A and AA compliance issues revealed through this review precludes many users with disabilities who have a right to access this information. In this next section we review another non-compliant political party website and discuss the redesign of the site to meet Level AA compliance.

Methodology

The methodology employed for the review and redesign of the Dignity for Disability (D4D) website involved: 1) preliminary and comprehensive reviews of the existing site; 2) identification of the changes required and redesign of the site to address the identified accessibility issues; 3) review of the redeveloped website; 4) final user testing.

1) Review of existing site

Consistent with W3C recommended evaluation protocol (W3C Website Accessibility Conformance Evaluation Methodology 1.0: W3C Working Draft 2012), the review of the existing website involved the following steps:

   a) Preliminary review involving testing the website using a range of assistive technologies (including WebAnywhere and NVDA screen reader)
   b) Full conformance review using semi-automated testing tools (W3C validation, SortSite, Cynthia Says and WAVE)
c) Manual checking of features not easily tested using semi-automated tools (such as use of colour, animating images and impact on the site with features turned off)

d) Testing site with users of assistive technologies

2) Redesign of the D4D website

The D4D website was then redesigned to address the identified accessibility issues. The redesign included the following changes:

- Incorporation of a Content Management System (CMS) making it possible for D4D volunteers to maintain the site longer term
- Strict adherence to coding standards
- Using descriptive alternate text on relevant images
- Consideration of colour and contrast differences, and provision for user to change the style and colour contrast settings if they wish
- Using a hidden, but functional skip to content link
- Designing a logical navigation structure
- Innovating a simple, but effective alternative to Captcha
- Ensuring correct use of labels on form elements
- Avoiding unnecessary use of tables
- Logical nesting of header tags
- Using a logical flow of content that flows correctly even when CSS is disabled
- Ensure that images are sized as presented to minimise page load time
- Using descriptive link text or descriptive link titles when an image link is used
- Setting link titles to indicate when a page will open in a new window
- Ensuring that all pages have descriptive and unique titles

3) Review of redesigned D4D site

As with the initial review of the existing D4D website, the review of the new D4D site involved the following steps:

a) Preliminary review involving testing site using a range of assistive technologies
b) Full conformance review using semi-automated testing tools (W3C validation, SortSite, Cynthia Says and WAVE)
c) Manual checking of features not easily tested using semi-automated tools

4) Final usability testing with users of assistive technologies

The final stage of the review process involved testing the site with four users, three of whom are users of assistive technologies.

Results

Conformance level of the D4D website pre and post redesign

Table 2 summarises the findings from review of the D4D website before and after redesign. As seen in Table 2, the existing D4D website revealed many accessibility issues at all three levels of conformance impacting on the capacity of the primary target audience to access information and participate in D4D online activities. Following redesign only one compliance issue remained (relating to the inclusion of PDF newsletters on the site). This issue is examined further in the discussion section of the paper.
<table>
<thead>
<tr>
<th>WCAG 2.0 Guidelines</th>
<th>D4D pre redesign</th>
<th>D4D after redesign</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level A compliance issues</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Provide text alternatives</td>
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<tr>
<td>Provide summary attributes for data tables</td>
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<td></td>
</tr>
</tbody>
</table>

**Table 2** – Accessibility conformance issues identified in the D4D website before and after redesign

**D4D website prior to redesign**

Some of the major accessibility issues identified from the review of the website prior to redesign are illustrated in the following screenshots.

Figure 1 shows the use of Captcha associated with the donation form. The image is not accessible to users with vision impairments and the audio alternative is very difficult for most users to comprehend.
Figure 1 – Inaccessible Captcha system employed in D4D site prior to redesign

Figure 2 illustrates the problems associated with long drop down menu systems that are JavaScript based and rely on ONCLICK handlers without providing an equivalent ONKEYPRESS handler.

Figure 2 – Inaccessible drop down menu employed in D4D site prior to redesign

D4D website following redesign

The features employed in the redesign of the D4D site are illustrated in the following screenshots. Figure 3 shows the CMS interface enabling D4D members to update the site without requiring web design skills. Figure 4 illustrates the simplified menu navigation system incorporated into the revised site and Figure 5 illustrates the alternative, accessible
Captcha system employed in the new site, which requires the user to type the first three letters of a randomly generated set of characters.

Figure 3 – CMS employed in the redesign of the D4D website for ease of maintenance

Figure 4 – Simplified menu system used in the redesign of the D4D website
Usability testing

Consistent with recommended usability testing protocol (W3C Website Accessibility Conformance Evaluation Methodology 1.0: W3C Working Draft 2012), the Dignity for Disability website was reviewed by four expert users, three of whom rely on alternative accessing devices to navigate websites. These users included: a vision impaired individual who relies on screen magnification to view web pages; an individual who is blind and uses the JAWS screen reader; another individual who is blind and accesses websites using a refreshable Braille display; a representative from a UK organisation that provides support for people with Dyslexia. Each of these users were invited to review the D4D website before and after redesign, both independently and again with the developers present remotely (via Skype) during which they were asked to report their experiences as they navigated specific pages and attempted to complete specified tasks (such as completing the form, using the alternative to the Captcha system and logging into the site). These users’ comments based on their experiences accessing both versions of the D4D website are reported in this next section.

Vision impaired user

“To view websites I use the built-in screen magnifier in Windows 8 and zoom around 3-4x magnification. The new D4D website provides significantly improved accessibility with an intuitive layout, clear navigation and good use of ready-to-read fonts and effective contrast” (Scott Hollier 2013).

Screen reader user

“The old home page was very long with a mixture of major and minor items all sprinkled on the page. It would benefit from being much shorter and with the content being organised in a more meaningful manner. I kept wondering why different items were on the home page and whether they were more significant than they seemed. Also when I reached the fields for username for logging, I didn’t know it was a login situation although I guessed when the next field was ‘password’. The new page was much clearer that it was a login area. The new home page is far superior. It is shorter and more logically organised. It had the feel of a home page. It read well with a screen reader. In my view, a home page does not have to be restricted to
ONLY major more permanent content. I think having some current information that rotates every week or month can draw readers back to get headlines, so to speak, of timely information and draw readers to check the page frequently. The new page, not only has the feel of a home page, it feels more professional and adds credibility to the entire site. I encourage the designers to continue developing the site” (Norman Coombs 2013).

Refreshable Braille display user

“I use the Braille Sense U 2 made by HIMS in South Korea. I have found the website www.d4d.org.au loads in very quick time, in comparison to the previous www.d4d.com.au and many other sites. I like this fact, it makes wanting to browse the site an enjoyable, frustration free experience. To me, this is one of the most important features of a website, when pages take ages to load, it means that looking for information takes up too much time and is demotivating. I also note that the captcha that requires to be filled out to make a donation is by far and away the best captcha solution of any site I have visited. The captcha on old site froze my unit. I was able to get information about the Board and read profiles of the Board Members very easily. I was able to download policy documents and read them on my U 2 that is, those documents that were in doc format, a small constructive criticism is that the document regarding the Board Structure in PDF is not my preferred format, often these documents are not able to be read by many units. Perhaps making this information also available in doc, rtf or ASCII would help this situation? I like the sitemap link to get a list of links to information I would like access to. I was able to access the tweets. I liked the being notified that there was a "photo" of Paul Collier. I was able to read about Paul fine. I too was able to read about the history of the Party. All in all the site worked fantastically well with the U 2 and on visiting the site 4 or 5 times since yesterday each time the site has loaded excellently” (Peter Greco 2013).

Representative from organisation representing people with Dyslexia

“The new site is so much better than the last one. Getting rid of the drop downs has made it so much easier to navigate! As regards to the customising, it was hard to find the button on the footer and without your guidance I wouldn't have found the right page for it. A mention of this on the home page would've helped a lot. I couldn't get comic sans to work (I am using an iPad though) and I couldn't tell the difference between the black and blue text. Yellow was definitely the best back ground for us! Some more colours would be a help, as I know that there are many different colours that benefit many different people within the group. The cream didn't make too much difference to the white but yellow was definitely better. A paler blue text would have made a bigger impact” (Melanie Murrell 2013).

Discussion

The results of semi-automated review and usability testing of the original and redesigned D4D websites show that with some consideration of W3C WCAG 2.0 guidelines, it is possible to create a website that is compliant to a minimum of Level AA. The user feedback indicates that the redesign has made a significant difference to the accessibility and usability of the D4D website.

Despite these obvious improvements, there are some remaining challenges relating to the CMS itself, which currently only meets Part B of the ATAG 2.0 requirements. While the CMS does produce websites that are accessible, the interface itself does not meet all the requirements for Part A ATAG 2.0 compliance. This is largely related to the third party editor employed in the system. Future developments of the CMS will need to address this limitation.

As noted in the previous section, the new site website still incorporates PDF newsletters. While alternative formats of the newsletters are provided in RTF, the PDF documents themselves are not appropriately marked up. This will require training of D4D members who are responsible for updating the site to be able to create future PDF documents with the required mark-up using Adobe Acrobat Professional’s accessibility features.
The comments made by the representative from a Dyslexia support organisation in the UK highlight another challenge in trying to accommodate the needs of a diverse audience. Many of the colour combinations this user suggested would be best for people with Dyslexia fail to meet minimum W3C colour contrast requirements. The solution implemented on the site is to provide users with the option to change the colour contrast settings and font size and style. The default style sheet does, however, meet W3C colour contrast specifications.

The difficulties in adhering strictly to W3C accessibility guidelines when an alternative approach might be more accessible for the target audience has been identified by several authors who argue that there are examples of websites that attain a high level of W3C accessibility conformance, yet are not accessible or usable (Kelly et al. 2005). As this research has shown, there is a need for a common sense and practical approach to the design of websites that aim to be both accessible and usable for a wide and diverse audience (see for example Brajnik (2009) and Koutsabasis et al (2010) for a more extended discussion).

Conclusion

The review of the literature reported in this paper highlights the responsibilities of governments that are signatories to the UN Convention on the Rights of Persons with Disabilities to ensure that their citizens can access online information and services in order to exercise their rights to participate in political and public life. The Australian Government’s National Transition Strategy represents a major step toward the achievement of this goal in prescribing a process and path to W3C WCAG 2.0 Level AA compliance for all government websites by the end of 2014. Yet the review reported in this paper indicates that political parties have not made the same progress in mapping a strategy for transitioning their sites to meet W3C WCAG 2.0 guidelines. With an estimated four million people in Australia (18.5%) reported as having a disability in 2009 (ABS Survey of Disability, Ageing and Carers 2009) it makes no sense and is certainly not equitable for political parties to be excluding potential supporters from access to their information and services. The case study reported in this paper has been presented to provide web developers with a practical approach to redesigning websites to meet W3C WCAG 2.0 requirements, while also demonstrating the importance and the value of usability testing undertaken by users of assistive technologies.

In conclusion, as the title of the Nomensa (2011) article implies, ‘If accessibility got the deciding vote’, the findings from the review reported in this paper suggest that at this point in time most of our major political parties would be out of the running! The strategies outlined in this paper, if applied to the redesign of political party websites, could well open up the opportunity for Australian political parties to attract that all important ‘deciding vote’.

Acknowledgements

The authors would like to express their appreciation to our usability testers (Scott Hollier, Media Access Australia; Norman Coombs, EASI; Peter Greco, Radio 5RPH; and Melanie Murrell, Salisbury and District Dyslexia Support Group) who so generously gave their time to reviewing the D4D website. Thanks also to Dr Brian Matthews, adjunct Senior Lecturer, Flinders University of South Australia, who provided valuable feedback on an early version of the manuscript, and Kelly Vincent, Rick Neagle, Anna Tree, Peter Cookson and other members of the D4D political party for their commitment to ensuring the D4D website is accessible to people with disabilities.
References


Endnotes

1. The D4D website has been redesigned to incorporate a content management system (CMS) developed by Metadas Media.

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*GSA InfoComm*

Gunela Astbrink has worked in disability and technology policy and research for 25 years both in Australia and internationally.  
She led projects at the Telematics and Disability Centre of Telia (Swedish Telecom) and the European Union-funded project, COST 219 (Telecommunications: Access for Disabled and Elderly People) in the 1990’s. Gunela was part of the Smart Internet Technology Cooperative Research Centre’s user-centred design group and led a project on multi-modal mobile devices.  
For over 10 years, Gunela was National Coordinator of TEDICORE (Telecommunications and Disability Consumer Representation) ensuring that people with disability participated in policy and standards development to improve telecommunications accessibility.  
Gunela is participating in the EU-funded project CARDIAC to develop a research roadmap for future funding of accessible ICT and assistive technology.  
Gunela Astbrink is Director on the Board of the Internet Society of Australia and a member of the Advisory Board of the International Center for Disability Resources on the Internet as well as a Fellow of the Royal Society of Arts. She holds an adjunct senior research position in the Institute for Integrated and Intelligent Systems at Griffith University.

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Carolyn Bilsborow was recently awarded a Doctor of Philosophy degree in the School of Communication, International Studies and Languages at the University of South Australia. She has produced several short documentaries for both research and learning and teaching projects within UniSA, most notably two documentaries for the 'Northern Community Summit' event held at Elizabeth in 2008, supported by UniSA. The project went on to win the 2009 Chancellor's Award for Community Engagement. She was employed as a research assistant on this project providing technical support for the iPad and software use.

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Robert Campain
Scope

Dr Robert Campain is a Research Fellow with Scope (a disability services provider in Victoria, Australia) and an Honorary Research Fellow with Deakin University. He holds a doctoral degree in sociology. He has conducted research into a number of areas related to disability, particularly in relation to the social inclusion of people with disability, person centred approaches, and outcomes measurement for people with disability and their families as a result of service provision.

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Darren Candler

*Metadas Media*

Darren Candler (Das) is founder of Metadas Media, a UK based company specialising in content management systems and accessible web development. Darren was a co-developer in the redesign of the D4D website and the Metadas CMS was incorporated into the design to ensure the ongoing sustainability of the site.

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Margie Charlesworth

*Women with Disabilities and Participant co-researcher, University of South Australia*

Margie Charlesworth has worked for many years in the fields of disability advocacy, receiving many awards for her work with various disability services groups. Through the organisation ‘Women with Disabilities’, Ms Charlesworth is the project co-ordinator for the ‘Don’t Cross the Line’ project, preventing violence against women with disabilities.

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Dr Tim Connell has provided psychological services to children and young adults with disabilities from 1977. This was first as a psychologist for the Novita Children’s Services Inc. He developed and managed a specialised, multidisciplinary rehabilitation program for teenagers with ABI from 1984-1995. He was Clinical Manager of Psychology & Counselling Services, responsible for the quality of clinical services provided by nine clinical psychologists at Novita since 27/7/93. He is a member of the Colleges of Clinical Psychology and Educational and Developmental Psychology of the Australian Psychological Society, and his PhD was in the area of neuropsychology (The role of the basal ganglia in cognition and language.) He is also a clinical lecturer at the University of Adelaide, Flinders University and the University of SA. From 2009 he has been Clinical Lead (Psychology) in the SA Dept for Communities and Social Inclusion, providing services to adults.

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Caitlin Fry graduated from the University of South Australia with a Bachelor of Psychology and Bachelor of Arts (Honours), where she is also a current PhD candidate. She currently tutors at the University of South Australia in their School of Communications, International Studies and Languages, and she currently provides ongoing administrative and research support to the ‘Private Lives and Public Policy’ project.

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Peter Gerrand
Managing Editor, TJA

Peter Gerrand has been Editor-in-Chief of the Telecommunications Journal of Australia since 1994, and Managing Editor since 2009.

He was awarded the Charles Todd Medal by ATUG in 1998 'for outstanding contributions to the telecommunications industry', an Australian Government Centenary Medal in 2003 'for outstanding service to science and technology particularly to public science policy', and Life Membership by the TSA in 2003.

From 2004-2007 he carried out research at La Trobe University in the School of European and Historical Studies, and was awarded a PhD in Spanish and Catalan studies in 2008. His thesis, “Minority languages on the Internet: promoting the regional languages of Spain”, was published by VDM Verlag in 2009.

He is currently an honorary Professorial Fellow at the Melbourne School of Engineering, University of Melbourne; and an Adjunct Associate Professor (Research) in the School of Languages, Cultures and Linguistics at Monash University.

Emma Grace
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Emma completed an honours degree in speech pathology in the area of Augmentative and Alternative Communication. She is a Senior Speech Pathologist at Novita Children's Services working with children with physical disabilities, complex communication needs and dysphagia. She has been actively involved in a range of research projects and activities conducted at Novita as Research Officer and Clinical Research Senior.

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Nick Hagiliassis

Scope

Dr Nick Hagiliassis is Research Coordinator and a Consulting Psychologist with Scope (a disability services provider in Victoria, Australia) and an Honorary Research Fellow with Deakin University. He holds a doctoral degree in psychology. Nick has an interest in research that aims to improve the lives of people with disabilities through influencing practice and policy. His special interests include mental health and disability, measuring outcomes associated with disability services, and tracking and improving social inclusion.

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Marion Hersh

University of Glasgow

Dr Marion Hersh is a senior lecturer (associate professor) in Biomedical Engineering, University of Glasgow, Scotland. She has over 160 research publications. Particular projects include user-centred design of assistive technology, subtitles for deaf people, assistive travel technology and modelling the spatial representations of blind people, communication devices for deafblind people, inclusive learning technologies, including educational games.

She has organised a conference series on assistive technology for sensory impaired people with European Commission funding; co-edited and contributed to Assistive Technology for the Hearing Impaired, Deaf and Deafblind and Assistive Technology for Visually Impaired and Blind People, published by Springer Verlag in 2003 and 2008 respectively, and has plans for a book on assistive robotics. Marion recent completed a Leverhulme Trust Research Fellowship on Mobility for Blind People. She has developed an innovative three-component model of the travel processes of blind, sighted and visually impaired people and co-developed the Comprehensive Assistive Technology modelling framework.

Marion is a chartered engineer and chartered mathematician, with a PhD in control engineering and a degree in mathematics, speaks seven languages fluently and has some knowledge of several others, including British Sign Language and the UK and Lorm deafblind manual alphabets. She has good contacts with several organisations of disabled people.

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Ian Kirk

*Participant co-researcher, University of South Australia*

Mr Kirk has formally worked in rural news media, while pursuing an interest in word prediction programs, including developing his own. He has sat on many disability-related boards and consumer groups, and is a Life Member of Technical Aid to the Disabled.

Charles Morris

*University of South Australia and Metadas Media*

Charles Morris is a programmer and web developer with expertise in accessible web design. He has undertaken several contract projects with the University of South Australia and was co-developer in the redesign of the D4D website.

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Robert Morsillo

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Robert Morsillo is a Research Fellow at Swinburne University focussing on the CCI-funded Broadband Services 2015 project. He has a background in electrical engineering, computer science, theology, community development, public policy, communications and consumer affairs. He is particularly interested in the role of technology in encouraging a sense of connectedness, and in encouraging user innovation within the communications industry.

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Lareen Newman

*Flinders University*

Lareen is a Senior Researcher in the Southgate Institute for Health Society & Equity at Flinders University – a national centre for research on the social determinants of health. She is a social geographer whose work is increasingly focusing on the digital divide impacts on public access to services, particularly for disadvantaged and marginalised groups. Since 2008 she has led a range of research for the SA Government's Health In All Policies program. Lareen previously worked for the Australian Bureau of Statistics and Uniting Care Wesley. She was guest editor for a Health special issue of the Journal of Community Informatics, and is guest editor for the Australian Journal of Primary Health's forthcoming E-Health issue.

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Parimala Raghavendra  
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Dr. Raghavendra is a Senior Lecturer in the Department of Disability & Community Inclusion. She is a speech pathologist with over 30 years of research, clinical and/or teaching experience in working with children and adults with disabilities, especially those who have complex communication needs using augmentative and alternative communication. Her areas of research interests are: Understanding and measuring the participation of children with disabilities especially those with complex communication needs at home, school and community; enhancing the participation of children and adults with complex communication needs using main stream and assistive technologies. She has studied and/or worked in India, Singapore, USA, and Sweden.

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Janelle Sampson  
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Janelle has worked as a speech pathologist in the area of Augmentative and Alternative Communication (AAC) for over 20 years with both adults and children. Much of this work has been around assessing and prescribing AAC systems, and consultation to state run equipment programs for the provision of AAC devices. From 2007-2009, she was the manager of the Statewide Complex Communication Needs project, a time limited project designed to review and support the equipment and communication needs of adults and children with complex communication needs (CCN) in South Australia, and pilot programs that promote their participation and inclusion. For the past 2 ½ years, Janelle has worked in private practice with both adults and children who use AAC systems.

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Sheila Scutter  
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A/Professor Sheila Scutter is an adjunct Associate Professor in the School of Health Sciences at the University of South Australia, and also holds an adjunct position in School of Medicine and Dentistry at James Cook University. Her qualifications include a PhD (Science), Master of Educational Studies, Graduate Diploma in Physiotherapy (Hons 1) and Bachelor of Applied Science (Physiotherapy).

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William Tibben  
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William is currently a Lecturer in the School of Information Systems and Technology at the University of Wollongong. He has recently completed his PhD which investigated community technology centers (CTCs) in regional NSW Australia. Previous to his current role, Will worked in broadcast technical training roles in the Pacific during the 1990s – 4 years with the Samoa Broadcasting Service and periodic assignments for Pacific Islands Broadcasting Association (PIBA). Prior to this Will worked for the ABC in both radio and television in Sydney for 12 years. He has researched and published in telecommunications policy in the Asia-Pacific and has participated as an individual member in the consumer representative organisation ACCAN (Australian Communications Consumers Action Network) and CTN (Consumers Telecommunications Network), two years as a board member (2000-2002). Will has also been active in the Pacific Islands chapter of the Internet Society (PICISOC) and held executive positions on its board from 2009-2012.

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Erin Wilson  
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Dr Erin Wilson is a Senior Lecturer at Deakin University where she co-ordinates the major pathway in disability within the Bachelor of Health Sciences. She holds a doctoral degree in Social Work in the field of community development. Her current research in disability focuses on outcomes measurement, inclusive practice and human rights in both Australian and developing country contexts. She has previously undertaken research in the area of effective policy in regard to Assistive Technology provision. Erin has a special interest in research methods that enable the participation of people with disability as researchers, respondents and in advocating change based on research findings.

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Denise Wood  
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Associate Professor Denise Wood is the Associate Head of School: Teaching and Learning, and a researcher in the School of Communication, International Studies and Languages at the University of South Australia (UniSA), and an Extraordinary Professor (Adjunct) in the Faculty of Education at the University of the Western Cape, South Africa. Her research focuses on the use of accessible information and communication technologies (ICTs) to increase social participation, as well as the pedagogical benefits of social media in teaching and learning. She has been the project leader of three national teaching and learning funded projects and several State Government and industry funded projects, and her work in innovative teaching and learning, and accessibility solutions for learners with special needs has been recognised with several awards including an Australian Learning and Teaching Council Citation for Outstanding Contributions to Student Learning.

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