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## **ADAPTIVE TECHNOLOGY FOR PEOPLE WITH PHYSICAL DISABILITIES USING INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT)**

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Whether serving academic, public, or special populations, libraries are charged with making information available to their constituents. Electronic access, networked resources, and other forms of information and communications technology (ICT) are becoming the norm for information delivery. Technology, largely a boon to people with disabilities, may be difficult for some people to access. Assistive technology (AT) bridges this gap by providing innovative ways to help people access ICT. By using appropriate AT, libraries can improve information access—and quality of life—for large numbers of their patrons.

This chapter explores AT and its implications for people who have disabilities. Using the Australian experience as a foundation, the authors discuss AT and disability; how AT facilitates ICT use; how libraries can promote AT; and how libraries can select AT that will be used by their patrons.

### **Adaptive Technology and Disability**

Adaptive technology refers to products that help people who cannot use regular versions of products; primarily people with disabilities affecting their ability to walk or use their arms. According to the United States *Assistive Technology Act of 1998*, AT<sup>1</sup> (also called

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*adaptive technology*) refers to any "product, device, or equipment, whether acquired commercially, modified or customised, that is used to maintain, increase, or improve the functional capabilities of individuals with disabilities." The term "assistive technology" is used to refer to "a broad range of devices, services, strategies and practices that are applied to ameliorate the problems faced by individuals who have disabilities" (Baum, 1998; Cook & Hussey, 1995; Lupton & Seymore, 2000). Common computer-related AT products<sup>2</sup> for people with physical disabilities include screen magnifiers, large-key keyboards, alternative input devices such as touch screen displays, over-sized trackballs and joysticks, speech recognition programs, and text readers (Brooks, 1998).

Since the 1970s, the understanding of disability has changed dramatically. Once perceived as a largely medical problem affecting only a small number of people, it is now regarded as a major social and political issue. The most common types of disability are caused by physical impairments<sup>3</sup>, for example, 2.6 million people or 14% of Australians are thus affected (ABS, 2000). The Australian Bureau of Statistics 2003 survey on *Aging, Disability and Carers* indicated that the disability rate remained unchanged with one in five people, or 20% of Australians, reporting a disability. One in ten people in Australia identified that they used equipment, or an aid, to help them cope with their condition or manage everyday life. The disability rate steadily increased with age from 4% of 0 – 4 year olds to 41% of 65 – 69 years old to 92% of people 90 years and older. The proportion of people who stated that they needed help with self care, mobility and/or communication activities remained stable at 6.3% of the population (ABS, 2004). Traditionally, people with disabilities were defined as "disabled" because of their specific impairments such as, loss of physical function as the result of illness or injury. More recently the International Classification System of Impairments, Activities and Participation (ICIDH) has proposed a social model of disability that views disability as an inability to participate in activities (WHO, 1997). Consequently, the focus has shifted from the inadequacies of the individual with an impairment to the activity restriction or barriers in society that exclude people from participation. This has resulted in a number of legislative initiatives being enacted to assist people with disabilities to enter the

workforce and access the technology they require, to carry out various tasks.

### **Adaptive technology enables people with physical disabilities to access ICT**

Rob Garrett, the Assistive Technology Project Group Leader, Research & Development, Engineering & Support Team, NovitaTech [<http://www.novitatech.org.au/>] South Australia, has proposed a partnership for the research and development of technologies that will positively affect the health and well-being of people with a disability and the elderly. They emphasize habilitation, ageing in place, and prevention of injury and disability, as well as rehabilitation. The partnership recognises the significant potential for technology to positively affect the health, well-being and independent living of older people and people living with a disability. Within the telecommunications area proposed activities are:

- To identify and understand the needs and wants of people who cannot use a traditional telecommunications product or service.
- To research ways and methods to provide accessible telecommunications products and services.

Technology Information Providers has used the term since 2003, intended to increase knowledge sharing and networking in Germany, Great Britain, Spain, USA, Holland and France [[http://www.techassist.org.au/rizi/iaatip/default\\_eng.asp](http://www.techassist.org.au/rizi/iaatip/default_eng.asp)]. This is a list of assistive technology products for specific disabilities. Tech Assist On-line is a free technology for accessing computers. Tech Assist On-line is available for computers (hardware, software and ergonomic) [<http://www.techassist.org.au>]

Tech Assist On-line has recently been released in Australia:

[<http://www.techassist.org.au/option=content&task=view&id=8783&Itemid=2>]

In Australian society today, people with disabilities are increasingly demanding equal access to the full range of community resources, information and opportunities. Disability *per se* is no longer accepted as being a barrier to gaining an education, taking part in civil and political life, enjoying a fulfilling social life, raising a family, being involved in the community, or engaging in paid and unpaid work. On the contrary, the community now actively supports the participation of people with disabilities. Businesses and community organisations are expected to make reasonable efforts to make sure that people with disabilities can use their goods and services. Governments too are expected to facilitate the participation and inclusion of people with disabilities and are rightly held to a higher level of accountability by the community in this regard (ABS, 1999; ABS, 1996; AIHW, 2000).

Over the years, consumer advocates have identified and promoted five other consumer responsibilities: solidarity, critical awareness, action, social concern and environmental awareness. These various rights impact on adaptive technology and how it empowers and enables people with physical disabilities to access ICT.

It is common knowledge that persons with disabilities benefit from access to, and use of, ICT (Vincent & Morin, 1999). However, people with physical disabilities have a harder time using technology when it is physically difficult to use a computer (Covington, 1998; Cowan & Turner-Smith, 1999; Seiler, et al, 1997). Modifications to standard computer equipment and/or the use of modified techniques, including individualised set-up and positioning, help overcome some difficulties experienced by persons with disabilities and is regarded as the first point of intervention. Sometimes, simple strategies such as altering the position or height of the keyboard and/or the mouse are all that is required to enable the person to use a computer more efficiently. Some people with disabilities require the use of specialised equipment as well. The best equipment for them to use is decided by the provision of information and advice on a range of possible equipment options and, wherever possible, an individualised trial of the equipment. Of course, simple strategies of use also are teamed with non-standard or specialised equipment options for people with disabilities.

Computer access options refer to a range of strategies and equipment that are useful in assisting people with the difficulties encountered in using a computer. These options included alternative seating, positioning, keyboard, mouse and software options. Environmental Control Technology refers to equipment that enables a person to control their environment when their ability to use standard methods of control have been lost or diminished. For example, specialised remote control devices that are used in place of a number of standard remote controls and also incorporate the on and off control of lighting and electrical appliances. Switch access provides a means of accessing a range of activities including communication, computer access, leisure and environmental control. They are useful for people whose functional movement severely limits their ability to independently participate in a range of activities – an individualised switch set-up enables them to have some

There are a wide variety of switches available, with the most appropriate choice dependent on a person's particular needs and skills. Some switches can be pressed down, others only need to be touched and some only need the person to move close to them. Switches may be placed in any position and used with any body movement. Some specialised switches can be operated by puffs and sips of air or by electrical activity within the muscles.

independence. Switch access is used with activities such as listening to music, operating a computer or operating a communication device.

Keyboard options include keyboards with enlarged key areas, reduced sized keyboards, programmable keyboards, ergonomic keyboards and on-screen keyboards. Keyboard accessories are available for both standard and alternative keyboards. These are as simple as stickers that enhance the visual clarity of keyboard displays or key-guards, helping people accurately target keys. There are also mouse options for people with disabilities who have difficulty using a standard mouse. Alternative options include trackballs, track-pads, joysticks and remote sensor units. Software is available that assists with specific mouse functions. There is also switch operated scanning mouse software available.

An environmental control unit or device (ECU) provides an alternative means of operation various appliances within an environment. In a library an ECU might control appliances (e.g. TV, VCR); turn on/off lights; or facilitate telephone use. Appropriate selection of such equipment can enable people with disabilities to be more independent. It is important to ensure the right match between the person and the technology. The questions to ask when investigating environmental control options in the library include the following:

- What library equipment requires an alternative control device?
- What environment/s will the device be used in?
- What movement/s can be used to control or access the device within these environments?
- What type of display interface is required?
- How easy is it for patrons to learn to use the device?
- What are the set-up and training needs?
- Are funds available to cover purchase, installation, maintenance and training costs?

The most appropriate equipment choice to meet individual needs is best decided by the provision of information and advice on a range of possible equipment options, in relation to the factors above and, wherever possible, individualised trial of equipment is recommended. Over the past few years there has been a significant growth in the range of equipment available and this has greatly enhanced the possibilities for people who are unable to use the standard methods of environmental control.

If a person with disabilities is unable to use any keyboard options, speech recognition software may be a suitable option, but the learning curve and editing required can make it unattractive in a library setting. Speech recognition software recognises the words spoken by a person and translates them into text or commands for the computer to carry out. As this software is quite complex, it must be considered carefully for suitability and back up options (for example, an on-screen keyboard). The current versions

have improved significantly with regards to both the training and operation of the software. Desktop USB microphones are also available and are useful for people who are unable to independently position the standard headset microphone.

Central to any computer access solution is also the positioning of both person and equipment. Each individual person with a disability requires a unique mix of techniques and/or equipment that enable them to be successful at using their computer. For example, if a person with disabilities has difficulty in using standard computer software programs, there is a range of specialised software that caters to a variety of needs and skills. Examples include word processing software that speaks out what is typed and word processing software that displays text and symbols. There is also Access Enhancement

Software that predicts or completes text to reduce keystrokes required. This increases typing efficiency and improves the user's endurance. Specialised software helps people who are switch users or who have literacy or numeracy difficulties.

### **The Assistive Technology Information Centre Model**

In Australia, a model has emerged to provide unbiased information about assistive technology via the Assistive Technology Information Centre. An assistive technology information centre is a non-profit, non-government community organisation<sup>4</sup>. They (Chris, not sure if this should be singular or plural) do not sell any equipment, nor are they aligned with only the one equipment range or supplier – all suppliers are invited to display their relevant equipment. This service has a comprehensive, state of the art range of AT equipment including alternative computer input devices, voice output communication devices, accessible hardware and software, electronic and wireless environmental control systems, switches, switch operated equipment and positioning equipment necessary to support the effective use of this equipment. Both speech pathologists and occupational therapists staff the AT information centre. They provide professional, impartial advice, consultation and education about AT options. This consultation and information service enables people with disabilities, and those who support them, to trial a range of equipment options, customised to their individual needs and goals. Consequently, they are able to make an informed decision about the AT equipment options that best meet their individual needs, goals and physical limitations. In fact, this assistive technology information centre has a referral process that is open to anyone wanting to explore AT options, including people with a disability, their family members, carers or their service providers.

Information services operating where such centres exist help patrons by providing referrals and promoting awareness of the centres. Larger North American public libraries routinely have technology centres and sometimes even loan the equipment out for their clients to trial in their homes. While other countries undoubtedly would like to enjoy similar arrangements, in Australia, it is the state and university libraries that provide some AT equipment on site to enable people with disabilities to access their resources and services.

### **Including Patrons in AT Selection**

Despite the assistance and promise of independence offered by many devices and the growth in AT options, the rate of AT non-use and abandonment, and discontinuance remains high – on average about one-third of all devices provided to consumers (Hocking, 1999). The single most important reason devices are not used by consumers is because of lack of consumer involvement in their selection (Scherer, 2000). If the device meets the person's performance expectations and is easy and comfortable to use, then a good match of person and technology has been achieved. The perspective of the user must increasingly be the driving force in device selection, not the affordability of the

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<sup>4</sup> The Australian Rehabilitation and Assistive Technology Association (ARATA) was formed in 1995 to serve as a national forum on relevant rehabilitation technology issues. They hold regular conferences.

equipment and the speed with which it is obtained. To reduce device discontinuance, non-use, and abandonment, increasing attention needs to be paid to the person with a disability as a unique user of a particular device. AT users differ as much personally as they do functionally. Functionality in use of technology is evident in all the interviews. Each potential user brings to the AT evaluation and selection process a unique set of needs and expectations, as well as readiness for use. To achieve better AT outcomes, these factors are ideally assessed so that the AT can be customised to the user, training and trial use of devices arranged and additional supports identified.

### **AT, ICTs and their impact on people with disabilities**

Information literacy skills are fundamental to the successful use of ICT and information services for people with physical disabilities. Information literacy can contribute to: participative citizenship; social inclusion; acquisition of skills; innovation and enterprise; the creation of new knowledge; personal, vocational, corporate and organisational empowerment; and, learning for life (ALIA, 2003). While this definition of information literacy affords an insight into the notions encompassed by the term, there are several ‘faces’ of information literacy worth embracing (Bruce, 1997: 154).

Library and information services professionals have chosen to undertake a responsibility to develop the information literacy of their clients. They support governments at all levels, and the corporate, community, professional, educational and trade union sectors, in promoting and facilitating the development of information literacy for all as a high priority. In Australia, the Council of Australian University Librarians (CAUL) adopted the Australian School Library Association (ASLA) Statement on Information Literacy in 1994. The Australian Library and Information Association (ALIA) adopted their policy statement on ‘information literacy’ for all Australians in 2001 and amended it in 2003 (ALIA, 2003).

Information literacy promotes the free flow of information and ideas vital to a thriving culture, economy and democracy. ALIA believes that a thriving national and global culture, economy and democracy, will be advanced best by persons who recognise their information need. They also need to be able to identify, locate, access, evaluate and apply that information and to be information and technologically literate as deemed desirable per the “Thematic Debate on Information Literacy” (UNESCO, 2005).

Information pertaining to the availability and applicability of AT is a case in point. Some of the recent technological developments have changed the methods of ICT access in the context of the emerging ‘Information Society’. The ACTS AVANTI ACO42 project ‘Adaptive and Adaptable Interactions for Multimedia Telecommunications Applications’ (1995 – 1998) aimed to enable the integration of people with disabilities into this emerging information environment, with the main focus relating to the access of information. The ACTS AVANTI ACO42 project was based on the universal design approach and on the concepts of adaptability and adaptivity of information contents and user-to-terminal interfaces, building on the results of other related research and development activities in Europe. The field trials tested applications dealing with access

to information related to the accessibility of sites of interest or importance for the autonomous mobility of people with disabilities (for example, transportation, hotels, public buildings, and so on). The information was integrated into general databases for tourists and presented when requested by the user (Emiliani, 1997; Stephanidis & Emiliani, 1999). Fortuitously, these same databases are available in public and special libraries<sup>5</sup>.

People who previously had very little autonomy now use computers to speak, write, read, study, manage finances, organise their own lives, express themselves creatively, develop skills and hobbies, and gain employment. This has been an unequalled historic opportunity for people with disabilities to become more independent and productive. And the future of virtual reality, robotics, videoconferencing, mind switches and so on continues to unfold. However, there are no coherent government policies on AT and there seems to be no bureaucratic understanding of the economic necessity for such technology (Galvin, 1997). For example, it does not even feature in the Australian Commonwealth-State Disability Agreement, which allocates key policy responsibilities on disability matters between the Commonwealth and State governments.

### **The Importance of Enabling Legislation**

Legislation in the U.S., Sweden, Denmark, and other countries has greatly improved availability of AT by requiring equivalent access for people who have disabilities. In other countries, however, legislative progress has not been so swift.

Australia represents a good example of the work that still needs to be done. Smith, ( need a reference here?) so commendable for his work in Australia, pointed out that country's monumental policy failure in the area of AT. There are at least four different Commonwealth Departments mandated to cover AT issues (with responsibility for areas such as health, human services, employment, education and training), but none in fact did. There are various Australian State Departments that also cover AT issues, but only Health Departments flirt with the issue, through minimal and chaotic 'Program of Appliances for Disabled People' schemes.

Smith accuses Australia of having nothing remotely comparable with the United States' *Assistive Technology Act of 1998*. He argues that what is needed are creative government policies in Australia to fund, research and test AT and widely available opportunities required to trial and evaluate this technology. His suggestions include: taking AT directly to people who live in rural and remote regions (in fact, Queensland's Independent Living Centre (ILC) provides regular regional tours); technical support

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<sup>5</sup> It is worth noting that the distribution of the 2001 Paraplegic and Quadriplegic Association of Queensland Member Survey was available on-line, or by using paper and pencil, facsimile and by post. Thirty per cent of the responses were returned on-line from public libraries. A mere two years after the last survey, almost 90% of respondents reported that they had access to both the Internet and e-mail, which represents a significant difference to 20% reported two years previously. However, by the 2003 member's survey, this had reduced to only 51% of respondents having access to both the Internet and e-mail. This reduction in access and use of ICT might link to the fact that the majority of respondents (38.8%) indicated receiving the Disability Support Pension, while now only 32% of respondents indicated having employment of some kind

services for employers and job agencies, training for those who give advice and for end-users, publicised case studies of successes and, funding for the equipment itself. Many of these activities can be advertised and coordinated through local libraries.

Smith asserts that above all, channels of effective communication are needed to get useable information (in multimedia formats) out to therapists, teachers, job placement agencies, disability workers, employers and people with disabilities. Smith declares the wide spread use of AT by people with disabilities is an economic issue in that the appropriate policies will increase the employment and employability of people with disabilities, save the government welfare money, and enrich the lives of people with disabilities. It then becomes a win-win situation and overwhelming good sense (Smith, 2003: 20). Again, libraries, in their role as community information providers, can be leaders in such communications efforts.

It is desirable that similar legislation, such as the North American *Assistive Technology Act of 2004*, is introduced into all countries that do not have it, as soon as possible, and furthermore, an independent, disability equipment program be instituted. The current situation for obtaining assistive telecommunications equipment in Australia is inadequate. Customers with disabilities who need assistive equipment are not able to take advantage of competition in the marketplace. The situation is anti-competitive and discriminates against people with disabilities, limits their choice of carrier and the type of service. In the competitive telecommunications marketplace, a radical re-think is needed to make sure that consumers with disabilities are not discriminated against in taking up competitive deals because of their lack of access to a disability equipment program. Urgent action needs to be taken by the Australian Commonwealth Government and the Australian Communications Industry to investigate ways of operating a comprehensive, independent, centralised, consumer involved and universally available disability equipment program. At last Government action seems likely<sup>6</sup>.

This deficit has also been noted by Nguyen, Garrett, et al (2004) in their research into telecommunications options for people with physical disabilities. They present it as an ongoing challenge. Their research trialed and evaluated new configurable 'off-the-shelf' technological options that improve many lifestyle aspects for people with physical disabilities. They considered alternative solutions to improve the awareness and the telecommunications and ICT experiences of people with physical disabilities. Their research aimed to enable these members of the community to participate and experience telecommunications technology to the same extent as able-bodied people currently do. These researchers concluded that with the right policies, processes and support in place, current off-the-shelf solutions helped to alleviate problems and improved the lifestyle, social interaction, security and independence of many people with physical disabilities.

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<sup>6</sup> The Australian government Department of Communication, Information Technology and the Arts has commissioned the Allen Consulting Group [<http://www.allenconsulting.com.au>] to undertake a review of the Disability Equipment Program (DEP) and to present their findings by 12 June 2006. Part of their brief is to conduct small focus groups of consumers who use the DEP. They also are consulting with advocacy groups, regulators and equipment providers throughout March/April 2006.

## Removing barriers to library ICT access

Even with legislation in place and AT selected, there are four major types of ‘barriers’ to people with disabilities in using ICT and thereby accessing information. They are costs; or affordability; physical barriers associated with lack of training; technological problems related to connectivity; and social barriers. Costs are a barrier, because most people with disabilities have limited economic resources (Williamson, et al, 1999: 9). Other barriers for persons with disabilities being able to use ICT may also include being on the wrong side of a digital divide, being information illiterate and technologically illiteracy. Barriers may also include connection problems for rural and remote people, the isolation of the double-edged sword controversy<sup>7</sup> and, the inaccessibility of chat rooms to people with physical disabilities. Also identified as barriers are a lack of information or inadequate support in the person’s environment to set-up equipment.

Some of the cost barriers identified included the set-up costs for the hardware and software (for example, voice recognition), AT, the Internet Service Provider (ISP) and the on-going telecommunication cost, or Broadband. Some solutions to the cost barriers are cheap recycled ‘green’ computers, or computers available from local councils according to income/assets testing or from Technical Aids for the Disabled (TAD). A partnership, in Australia, between Technical Aid to the Disabled and the Internet Service Provider ISPOne advised in 2005 that they would provide Internet access to people who receive the Disability Support Pension<sup>8</sup>. Reduced earning capacity and the constant changes in technology exacerbated this problem. Technology changes approximately every two years and any government assisted funding system is not geared to that short turn-around time.

Another example of the kind of frustration professionals’ experience is the fact that high-level disability needs attract similar financial support to low level needs. These problems mean that often the ‘disability dollar’ is dissipated. As outlined above, little is understood of the needs of AT users and the quality of the outcomes achieved. Furthermore, while the Technology-Related Assistance for Individuals with Disabilities Act of 1988 (PL 100-407) was introduced in the United States of America to create new funding systems for technology assistance (Galvin, 1997), there is no legislation relating specifically to the provision of AT in many western countries. Consequently, AT resources/services are frequently fragmented and poorly funded with uncertain futures (Smith, 1995). Libraries can help by providing free, unbiased access to mainstream computer services and AT, but this may be of limited value to people who are unable to travel to the library facility.

Lack of training for people with disabilities in using the technology is another major barrier. Pell’s 1999 study quantified the extent to which the two types of technology,

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7. The double-edged sword refers to a small but growing body of work within disability studies that emphasises technology’s ‘doubled-edged nature’ (Oliver, 1990) and stresses that it can be ‘both oppressive and emancipatory, depending on the social uses to which it is put’ (Gleeson, 1999: 104, in Sheldon, 2003).

<sup>8</sup> This access through TADAust Connect Internet Service provider is a ‘Dial up’ service now available for five dollars and fifty cents (\$A5.50) a month – a service that usually costs thirty to forty dollars – with no set up fee and no limit on down loads, no connect or disconnect fee and is a local connect call on 1300 735 439 (toll free Australia wide).

computers and assistive devices, were being used by people with physical disabilities in Australia. Additionally, the amount and types of computer education and training being undertaken by people with physical disabilities was also examined. The particular target group was chosen because the existing literature suggested that the technology helped its members overcome many of the mobility and access problems which are often the only barriers preventing them from obtaining greater levels of independence (Pell et al, 1999, 56). Pell found that comparison between present computer ability and demographic variables indicated that there are significant relationships between the level of computer ability and the age of the respondent, the age of disability onset, and the type of disability. Respondents with quadriplegia were more likely to have higher levels of present computer ability than did those persons with paraplegia. The findings also indicated that training was required in two main areas. The first was in the basic use of computers and standard productivity tools, followed by more advanced skills. Such abilities would be highly sought in a society dominated by information production, transfer and analysis, and would improve employment prospects for people with disabilities. The second area for training was in the use of assistive devices (Andrich, 1999; Pell et. al, 1999, 58 – 59). In 2006, unfortunately, this position is still relevant and needs to be addressed. In a library setting, the problem is compounded, as both staff and patrons must be trained.

Connectivity also is an ongoing issue. One of the ironic barriers in reaching these levels (oops which levels? Need reminding here) is that in the information technology area new products are readily available and part of a highly competitive market. For AT to connect to and work with rapidly changing new technology is always a challenge. This is where national, regional, and international Standards become important. There is considerable work being done to develop and meet accessibility standards so that the future technology standards do not disenfranchise people with disabilities. At present, however, libraries may have to take a “best guess” approach when selecting AT where standards conflict. A good approach is to network with affiliated and neighbouring libraries and institutions to promote a consistent AT approach.

The most recent major change has been the advent of the new wireless technology. This wireless (or Wi-Fi) technology affords unbridled power to connect and the freedom to move. As wireless technologies continue to evolve, the future will be definitely wireless, and the potential of wireless technology for people with disabilities presents opportunities for freedom to be “sensed” and physical limitations to be continuously challenged and shifted. To fully realize this promise, developers must embrace the concepts of universal design

Universal design, design for all, or inclusive design is a very important concept for ensuring that mainstream manufacturers produced products into the future that are useable by all people in the community, and there are particular principles relating to that concept (Connell et al., 1997; Vanderheiden, 1998). There always was a need for particular AT. There are people who have very severe disabilities and it is unrealistic to expect a mainstream personal computer manufacturer to provide everything that assists such a person; for example, puff and blow as an interface, or a

switch in, and so forth. COST 219 (a European Commission Action on Telecommunications and Disability<sup>9</sup>) suggests three levels to universal design: make as many products as accessible as possible; connect AT and mainstream equipment; and provide appropriate AT (Roe, 2001).

A final barrier, often cited as the most important, is the negative societal view of disability. Identifying and understanding the heterogeneity of AT users enables libraries and other service providers to develop a range of resources and services to meet the diverse needs of AT users. With the identification of issues and support strategies for AT use in society, appropriate measures can be implemented to ensure that the spirit of disability discrimination legislation actually enables people with disabilities to be integrated into society.

### **The future - improving information services**

Goggin and Newell remind us that recent developments in ICT are commonly regarded as the panacea for persons with physical disabilities. This is because the technology can give people with disabilities access to the total virtual world and many aspects of the real world previously inaccessible to them. Therefore, the technology has the capacity to be empowering for people with disabilities (Shearman, 1999: 3; Sheldon, 2003). However, we need to be ever mindful 'that in whatever we do we have the opportunity to disable or enable' (Goggin & Newell, 2003: 154):

*In different accents and voices, we are ceaselessly promised that technology will deliver us from disability. Yet we would suggest not only that technology will never deliver society from the reality of disability, but that disability continues to be constructed through such technology. As a socio-political space, disability will continue to exist, and technology will remain an important site in which it is constructed (Goggin & Newell, 2003: 153).*

Extensive IT development and society's capacity to embrace technological change mean that people with disabilities can participate where factors over which they themselves have control are the main limits to their connectivity.

Ultimately, access to ICT and information/libraries for persons with disabilities are contingent on acceptance, affordability, usability, and the adoption of Universal Design principles in equipment and in information format. Great opportunities and immense challenges lie ahead. All stakeholders need to be challenged to develop strategies and initiatives to foster a collaborative approach to problem resolution that will be of value (and impact) for people with disabilities in this global world.

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<sup>9</sup> COST [<http://www.stakes.fi/cost219/>] is a framework for scientific and technical cooperation in Europe, the main aspect of which is the co-ordination of national research on a European level. The COST co-operation consists of the European Commission, the fifteen EU Member States and ten non-member states. COST is based on a flexible set of arrangements enabling different national organisations, institutes, universities and industry to join forces and make concerted efforts in a broad range of scientific and technical areas.

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