Australian Communications Consumer Action Network

(ACCAN)

Broadband Solutions for Consumers with Disabilities

Jim Slater, Jan-Ingvar Lindström and Gunela Astbrink

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Australian Communications Consumer Action Network
Suite 402, Level 4, 55 Mountain Street

Ultimo NSW, 2007 Australia

Telephone +612 9288 4000

TTY:+612 9281 5322

Fax +612 9288 4019

Email info@accan.org.au

Website: www.accan.org.au

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FOREWORD

The Australian Communications Consumer Action Network (ACCAN) commissioned an international study into broadband applications benefiting people with disabilities. The aim of the study was to highlight current or planned innovative high-speed broadband applications that would benefit people with disabilities and enable them to participate more fully in society. This study forms part of ACCAN's vision to work for 'available, accessible and affordable communications that enhance the lives of consumers'.[1]

Two international experts in the field of ICT and disability undertook the study between November 2009 and January 2010. The primary focus of the study was on broadband applications in Europe, with examples provided from the United States and Japan.

The study is timely, due to the development of the National Broadband Network and its widespread implications for the way Australians will communicate, study, work and play. Examples from the study were presented by ACCAN at the Broadband Futures Forum on 10 December 2009. This forum was opened by the Prime Minister, the Hon. Kevin Rudd.

The study is also timely with regard to the work being undertaken to establish the National Disability Strategy. Preliminary findings from the study have resulted in input being provided to the Department of Broadband, Communications and the Digital Economy for its involvement in the Inter-Departmental Committee on the National Disability Strategy.

The report discusses the advantages of high-speed broadband such as:

- new services becoming available
- waiting times reduced
- constant availability
- advantages for service providers – and their clients.

However, it also warns that high-speed broadband capacity is neither free nor infinite. This is important in terms of streaming of digital data – especially video, where some applications may ideally be a combination of broadcasting and broadband services.

A key area discussed is the innovative use of video and TV-based applications to deliver potentially life-transforming services for consumers with disabilities.

The report provides an overview of these applications, together with other types of services using high-speed broadband. An important point is that, while some of these services may not in themselves require high-speed broadband, the capacity required to offer them to a growing number of people at peak demand times will mean that the services will always remain usable. Significant growth in applications and volume should also lead to falling prices and wider accessibility.

Importantly, the report provides examples and illustrations of the ways that consumers with disabilities benefit from the various broadband services.

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[1] www.accan.org.au/uploads/ACCAN%20Strategic%20Plan%202010-2015%20v1%200%20(Nov09).pdf.

ABOUT THE RESEARCHERS

Jim Slater runs a high-tech consultancy company with special expertise in digital techniques, specialising in the management of research projects and the writing and editing of research reports. Jim spent many years as a broadcasting engineer for the BBC and the UK IBA, working on transmitters, studios, data broadcasting and teletext, and more recently taking responsibility for research projects in the telecommunications field, including a digital communications project aimed at helping older people and people with vision impairment to watch television – AUDETEL. He successfully managed the SATURN project, a European Commission-funded project to make smart-cards and terminals that use them accessible to all, including the use of radio frequency links between cards and terminals.

Jim has been investigating new developments in technology for many years, including the use of broadband techniques, and has given hundreds of presentations to universities and learned society groups, specialising in making complex technical subjects easily understood – a major aim of his books on satellite broadcasting, cable television, HDTV and electronics in the field of disability. Jim acted as consultant to the European Digital Video Broadcasting (DVB) Project in Geneva, and was employed as a consultant to the UK Digital Television Group. He successfully managed and monitored an Audio Description pilot project on behalf of The UK Digital Network, with 50 visually impaired viewers using digital terrestrial television. He currently acts as an expert assessor for European Commission research projects.

Jan-Ingvar Lindström, a professional engineer, was the Corporate Area Manager for Telematics and Disability at communications company Telia AB (Sweden) for many years, responsible for their activities on behalf of people with disabilities and older people. Jan-Ingvar has served on the program committees for a number of international conferences in the general area of assistive technology, and as a board member for a number of institutes, including the R&D Council of the Swedish Handicap Institute and the Swedish Dyslexia Foundation.

He is the National ICTA Representative within Rehabilitation International, was an Expert on Technical Aids for the World Federation of the Deaf, and acted as an Adviser for the European Technology for the Integration of Disabled and Elderly people (TIDE) funding program in Europe). He has played a major part in the Scientific Program work of the European COST 219 Action, the main objective of which is to increase the accessibility of next-generation telecommunication network services and equipment to older people and people with disabilities by design or by adaptation when required.

As Technical Director of Everycom, Sweden, Jan-Ingvar continues to provide research and consultancy services in order to ensure that the growing range of modern telecommunications equipment can be accessible to all.

Gunela Astbrink is the Manager of Disability Policy and Research at the Australian Communications Consumer Action Network (ACCAN). Previously, Gunela was National Coordinator for Telecommunications and Disability Consumer Representation (TEDICORE) for ten years.

Gunela has advocated for improved accessibility to ICT for consumers with disabilities over the past 20 years, both in Australia and internationally, by participating in regulatory, research and policy activities.

Gunela is a Director on the Board of the Internet Society of Australia, and in 2009 completed a project on capacity-building for improving internet accessibility policy development.

BACKGROUND

The introduction of the National Broadband Network (NBN) in Australia will make available a tremendous resource, connecting 90 per cent of all Australian homes, schools and workplaces with broadband services with speeds of 100 megabits per second – 100 times faster than those currently experienced by many households and businesses, and amongst the fastest of any such services in the world.

The remaining premises in Australia that cannot currently be provided with the full 100Mbit/s service will receive next-generation wireless and satellite technologies to deliver useful broadband speeds of 12 megabits per second.

While the advantages of having high-speed broadband networks available to businesses and homes have been well documented, it is anticipated that the introduction of such services could have particular benefits for people with disabilities, and this report focuses on this aspect, examining how particular groups of users might be able to make use of previously unavailable applications to improve their lives.

Universal access to high-speed broadband services, often called Next Generation Access networks, promises to have some major positive impacts on the lives of people with different disabilities, allowing them to lead more fulfilled lives and to participate more fully in activities that able-bodied citizens take for granted.

The introduction of fast broadband does not automatically mean that new services will immediately become available. When there is a commercial advantage, new services will be offered quickly, but companies tend to be reluctant to introduce new services of benefit to people with disabilities when there are uncertainties about their likely take-up and commercial viability. This situation can change significantly if there is government support for the introduction of new services, in answer to strong consumer demand for equality in access to services.

It should be noted that just because the Australian high-speed broadband network has tremendous capabilities, this doesn't mean that networks and servers in other countries will be able to cope with the large amounts of high-speed data that some of the applications mentioned in this report will require. Recent examples of popular sporting events carried as video streams over the internet have led to situations where overall internet capacity, particularly the ability of some servers to deliver enough data at sufficient rates, has compromised the ability of the service providers to serve all users satisfactorily.

The general outlook, however, suggests that more and more digital data-transmission capacity will become available in the near future, as governments worldwide seek to maximise the usage of the spectrum that will be freed by the switching off of analogue television services – the spectrum space used for one single analogue TV transmission can be used to carry many digital TV and radio transmissions simultaneously.

As an example, the recent 'Digital Dividend' Green Paper[2] from the Australian government seeks to maximise the benefit that use of the freed spectrum will bring to the Australian community and economy by reorganising broadcasting services to clear a block of spectrum – perhaps as much as 126MHz. The data capacity that these developments will make available, in conjunction with the Australian National Broadband Network, should prove more than adequate to carry the many services for people with disabilities that are discussed in this report.

ADVANTAGES OF HIGH-SPEED BROADBAND FOR PEOPLE WITH DISABILITIES

New services become possible

Faster access to broadband means that more data can be downloaded (or uploaded) within a given period of time, so that applications requiring a great deal of data become practically usable for the first time. As a simple example, it is generally accepted that transferring video pictures requires a minimum of around 2Mbits/second for good-quality reproduction. This means that it would simply not be possible to provide any services requiring video if the only networks available had much lower data rates than this; therefore, the introduction of high-speed broadband can allow for completely new services involving video applications to be developed – these are considered in detail later in the report, but it is notable that in the United States, video relay services allow users to make phone calls almost in real time.

Waiting times reduced

Higher-speed data transfers reduce the waiting time required both to download information and to gain a response to a simple on-screen 'click' when seeking information. One study[3] suggests that two seconds is the threshold in terms of an average online shopper's expectation for a web page to load, and that 40 per cent of shoppers will wait no more than three seconds before abandoning a retail or travel site. While all users understand the frustration of long waits for something to happen in response to a mouse 'click', and the shorter the waiting time the less the frustration, the reduced waiting times that result from high-speed broadband may prove particularly beneficial for people with some types of cognitive, intellectual or mental disabilities, who may become irritated if the expected response to an action doesn't happen fast enough for their liking.

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2 www.dbcde.gov.au/consultation_and_submissions/digital_dividend/digital_dividend_green_paper.

3 Selvidge, P.R., Chaparro, B. & Bender, G. (2000) 'The world wide wait: Effects of delays on user performance', Proceedings of the IEA 2000/HFES Congress. Available from http://psychology.wichita.edu/hci/projects/ww%20wait.pdf.

Constant availability

The fact that high-speed broadband is available 24 hours a day, seven days a week can make it easier for those providing help and monitoring services to people with disabilities to assist their users outside the usual working hours. Web-based services can also be used to trigger and route immediate emergency alarm calls to appropriate service centres, without the person requiring aid needing to make a telephone call.

Advantages for service providers and their clients

High-speed broadband services allow organisations that look after the needs of people with disabilities to provide a wider range of information and services to their clients. Electronic newsletter and information sheets, and tailored advice about what to do in emergencies – perhaps in the form of simple video programs – can readily be disseminated, providing a major improvement in time, cost and effectiveness over having to send such information by post, fax or phone.

COMBINING BROADCASTING AND BROADBAND

Before considering the types of broadband services that can be provided for users with disabilities, let's look at some basic definitions and limitations to delivery.

Although the plans for an Australian National Broadband Network are extensive and promise to deliver large amounts of data and many new services to users, the capacity of such networks is not infinite, and there are key differences between streaming data services to any number of individuals and broadcasting.

Broadcasting (point to multipoint) (even if, confusingly, it is a stream of digital data that is being broadcast) is a process that sends data from one source to many receivers, and it is an extremely efficient system, in which the more people that use the transmitted information, the lower the cost per user becomes.

Streaming data (point to point) over a broadband network is quite different – it is a one-to-one data transfer process using the Internet Protocol (IP) to call up a continuous 'stream' of data that may, for example, represent the picture from the distant server on which it is stored, which the receiving equipment puts together bit by bit to regenerate the original material. Streamed data services are actually 'unicasting', not broadcasting, since each individual access requires a data link to be set up between the program or information provider's server and the customer's receiving equipment. Every additional service user requires the broadband provider or service company to provide more server space, and uses more of the network bandwidth – the required network capacity is proportional to the number of users.

For this reason, several of the potential services discussed in this report may use a combination of broadcast and broadband services – one example might be to provide high-quality digital signing services over broadband that are synchronised with the television programs being broadcast over the airwaves. The European Commission research project DTV4ALL[4] has successfully demonstrated this technique.

[4] www.psp-dtv4all.org.

DIGITAL TV AND THE DELIVERY OF BROADBAND SERVICES

Usability

The take-up and use of Television Access Services, which have involved broadcasters in considerable investment, is very much dependent on the ability of potential users to operate the equipment – it is useless for broadcasters to provide services if viewers find them too difficult to use. The current generation of digital TV receiving equipment is frequently difficult to use, with complex set-up arrangements and confusing operational requirements, and these 'usability' issues are creating a real digital divide between those who can use the current digital TV services and those who can't. Although this issue affects people who have disabilities and older people, the complications of using digital television are affecting vast numbers of people of all abilities. *Usability* needs to be improved in several areas, including the provision of clear, simple remote controls with large, well-spaced and well-labelled buttons. On-screen menu systems need to be intelligently designed, with displays that can easily be read and instructions that are simple and that work first time. As the introduction of additional facilities provided by broadband gets underway, great care will need to be taken that usability is not compromised. Digital television needs to be made usable by *everybody*. If this can be made to happen so that we can all use digital television simply and without complication, people with disabilities will benefit too. Users need to be involved with industry to improve the interfaces. Personal experience is important, and in particular the lived experience of disability will mean that products are designed to accommodate a great diversity of requirements.

Internet Protocol TV – IPTV

IPTV is a system where a digital television service is delivered using Internet Protocol (IP) over a network infrastructure, which may include delivery by a broadband connection. Although at its simplest the IPTV service could be received on a computer, allowing a broadband user to select from an infinite number of channels, for our purposes IPTV is *not* the delivery of services over the open internet (sometimes called internet television), but rather the delivery of broadcast-quality services over managed IP networks to the consumer TV set. IPTV thus provides television content that, instead of being delivered through traditional broadcast and cable formats, is received by the viewer through the technologies used for computer networks.

Viewers want to see TV programs on a TV receiver, and off-air, cable or satellite broadcasts are received via a set-top box, although integrated receivers that have the set-top box components built in are becoming more common. With the introduction of additional programs and services via IPTV, new 'hybrid' set-top boxes are becoming available that have broadband connections as well as the normal capabilities to receive broadcast or cable digital television. This arrangement provides the best of both worlds, with the viewer able to receive all the usual broadcast channels off air, via an antenna, broadcasting being the most efficient means of providing a restricted number of

services to millions of people. Yet if a particular specialist program or service is required, the same set-top box calls for it over the broadband connection, and any one of effectively an infinite number of services can then be provided to any particular user. These could be 'pay per view' TV services or special information services for users with disabilities.

Such hybrid services are sometimes called 'over-the top' services, since the broadband internet services are provided in parallel with and in addition to the broadcast services, and currently available set-top boxes can support combined IPTV and digital terrestrial services, with support for pause live TV, scheduled recordings and simultaneous play and record of different channels. The 'unified' interface allows all services to be accessed via a single 'program and services' guide, and users can use an infra-red connected keyboard to browse the internet and access emails and messaging services.

IPTV services are currently in use in Australia, France, Germany, the United Kingdom and the United States,[5] and the European Digital Video Broadcasting (DVB) Project has already developed several international IPTV specifications and standards, published by ETSI.[6]

Many of the suggestions that follow take advantage of the use of broadband services in parallel with normal TV broadcast reception, using hybrid set-top boxes to provide a wide and flexible range of add-on access services to enhance the viewing experience of users with disabilities.

> *The* Access to Electronic Media for the Hearing and Vision Impaired Discussion Report *details Australian government considerations for 2010 and beyond with regard to making media more accessible.*[7] *The Australian government has an opportunity to expand media accessibility by taking into account the activities underway in other countries discussed in this report.*

TV 'ACCESS SERVICE' APPLICATIONS AND SERVICES

Audio Description

Audio Description provides verbal explanations in gaps between the dialogue of TV programs or movies, helping people who cannot see details and would otherwise have difficulty in following the program. Broadcasters in the United Kingdom have for some time been providing over 100 hours per week of audio-described programs that are

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5 www.mythtv.org/wiki/DVB-IPTV

6 portal.etsi.org/docbox/.../NGN.../IPTV%20Asia%20Dec08/IPTV_leaflet.pdf

7 www.dbcde.gov.au/television/television_captioning/television_captioning_discussion_paper/media_access_discussion_report/media_access_review_discussion_report

regularly transmitted over the digital channels – effectively a third audio channel is transmitted as part of the digital TV program data stream. Although special equipment was at first required, set-top box manufacturers have now developed software solutions, and improvements in chipsets mean that Audio Description is now provided at little extra cost – a good example of a broadcaster-driven research project leading to a practical commercial solution that can benefit millions of people with vision impairment.[8]

The amount of data used to transmit Audio Description is relatively modest (typically 64kbit/s) compared with that required for the video component of a digital broadcast (2–3 Mbit/s), so the availability of broadband makes little difference to broadcast transmissions, but since high-speed broadband will be making a wider choice of program and service channels available to users in the future, it will be important to ensure that audio descriptions to accompany broadband services are allocated the required extra bandwidth and equally important to ensure that arrangements are made for synchronisation between the audio descriptions and the services streamed over broadband.

Signing

Signing for Deaf people is another area in which digital television shows great promise. Signed broadcasts are currently shown with the signer visible to all – open signing – but the signer needs to be of a reasonable size so that his or her actions can clearly be seen, and this can be distracting for viewers who don't need the service. The BBC and others are working on a 'closed' service that can display the signer or not, at the touch of a button, just as happens with subtitles. Motion capture and animation techniques are used to achieve this, with digital signals driving a cartoon representation of the signer – an 'avatar'. The system is not yet capable of adequate signing for television; there are problems with finger bends and positions, and in getting adequate detail in facial expressions; however, work continues, and 'avatar' signing may one day provide a satisfactory solution. There is, however, considerable resistance from some users to the idea of using avatars, and an ideal solution could be to have a full-resolution video picture of the signer, whose size could be varied by the user, inset into the main TV picture. This is not technically impossible, but would require large amounts of bit-rate, which is likely to remain a scarce commodity in digital terrestrial television where financial considerations tend to mean that any 'surplus' data capacity will be used to squeeze in more TV channels rather than to provide access to better services, the argument being that the access services are aimed at a much smaller audience.[9]

A related technology is SynFace, described in section 8 of the Appendix to this report, which allows an animated talking face to be controlled by the incoming telephone speech signal in real time, facilitating speech understanding by providing lip-reading support.

Research work funded by the European Commission under the SAVANT project (Synchronised and scalable AV content Across NeTworks) and the DTV4All projects has led to a demonstrator for video signing which provides a high-quality video image

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[8] www.rnib.org.uk/livingwithsightloss/tvradiofilm/Pages/audio_description.aspx.
[9] www.ofcom.org.uk/consult/condocs/signing/statement.

of the signer which the viewer can alter in both size and position on the TV screen as well as being able to choose whether to see the signing or not. The DTV4ALL video signing solution is a hybrid broadcast/broadband service. The program being signed is delivered over a broadcast network – terrestrial, cable or satellite – and the video of the signer is provided on-demand over a wired broadband IP connection. The hybrid Broadcast/Broadband delivery solution enables broadcasters to make the best use of their bandwidth to target the majority of their viewers, whilst the broadband system is ideal for providing extra information (the detailed moving video of the signer) directly to the receivers of those who require it.

Screenshot of a signing service provided on a 'virtual' channel over an IP connection in parallel with the transmitted TV program

Source: Courtesy Denmark Radio and the DTV4All project, www.psp-dtv4all.org.

The required system architecture in order to synchronise the delivery and display of the broadcast and broadband delivery is complex, but feasible. There is a Digital Video Broadcasting (DVB) compliant transport stream for the main digital television program, the Sign Language video encoded in MPEG4 and a service description (called service metadata) based on an extension to the TV-Anytime metadata standard. The service description links all the media elements/service components of the DVB service and holds the timing information required for synchronising them.

Subtitling: Any-language subtitles available via broadband

Broadcast TV subtitling is well established and takes up little bit-rate compared with the video, so the introduction of broadband is unlikely to have a significant impact. Where broadband could help, however, is in the provision of synchronised subtitles for a wide range of internet or broadband-delivered movies. The technology would allow for

subtitles, perhaps from some central subtitling house, to be called up whenever an 'on-demand' or scheduled movie is called for by a viewer, the subtitles being received as a separate data stream from the movie but synchronised with it at the receiver. This could be particularly useful in allowing a wide range of different languages to be made available to accompany movies, and one could envisage a subtitling centre being set up to deliver subtitles to accompany any streamed or downloaded movie in any available language.

Australia's Special Broadcasting Service (SBS) already provides multilingual and multicultural radio and television services to inform, educate and entertain all Australians, reflecting Australia's multicultural society, and may well provide a good basis for the establishment of some of these broadband-delivered services.

Spoken subtitles

TV and cinema subtitles can present accessibility problems for people with vision impairment and people with dyslexia, the problem primarily arising in non-English speaking countries where dubbing is not facilitated, such as in Scandinavian countries and the Netherlands. Research in Denmark, the Netherlands and the United Kingdom has shown that there could be technical solutions involving using a text-to-speech decoder which can be connected to the television. Effectively, the subtitle content in the presented video stream is decoded and read aloud through a multilingual speech synthesiser. One technique samples the analogue video signal into a binary image of the subtitles, uses optical character recognition to convert the binary image of the subtitles into characters that can be recognised by a computer, and then uses a speech synthesiser to read the decoded subtitles aloud. Such ideas, while feasible, are probably impracticable commercially, requiring specific equipment for a limited market of users with disabilities. The coming of broadband might enable subtitles in any desired language to be delivered from a special subtitling centre and synchronised with the broadcast television program or film.

Clean audio

For many years, the possibility of broadcasters providing a 'clean audio' channel, which provides the speech without any background music or other sounds, alongside the standard TV sound channel has been discussed and debated. With digital television, the cost (financially and in terms of the digital bit-rate usage) of providing an extra audio channel is modest, and it is believed that the extra production costs are likely to be small compared with the large number of people who would be helped by such a facility. There have been several research projects in the United Kingdom and elsewhere, including one sponsored by the old UK Independent Television Commission,[10] but no consensus on definitive standards has been reached, and no broadcaster is currently offering such channels. The ready availability of broadband data and hybrid TVs that allow for data to be received and played out alongside the

[10] www.acoustics.salford.ac.uk/res/shirley/itc/

normal TV transmissions could lead to a situation where a hearing-impaired viewer could select a 'clean audio' feed via broadband to match and synchronise with any TV program. The problems aren't technical, but rather lie in providing a business case or suitable funding for such services.

Broadband internet radio and TV

Access via broadband to radio and television stations around the world would give citizens programs in the language and culture of their choice. This could be extended to the provision of remote learning services, making use of multimedia presentation of content; for people with disabilities the output would be presented in modalities suitable for that individual. For instance, for someone with red/green colour blindness, the red and green could automatically be transposed into more distinguishable colours.

SERVICES AND APPLICATIONS BEYOND TV PROGRAMMING

Although it is often generally assumed that broadband services are likely to be accessed via a computer, work undertaken by researchers on behalf of the European Commission (EC) suggests that much of the target audience for services to help people with disabilities is likely to include older people who may be unfamiliar, and perhaps uncomfortable, with the use of a computer.

The EC project T-SENIORITY[11] – whose full title, 'Expanding the Benefits of Information Society to Older People Through Digital TV Channels', clearly sets out its aims – is intending to deliver broadband-based services via the user's television set, since it reasons that TVs are virtually universal, located in every home, and that people are familiar with the operation of such receivers and with their remote controls. The case initially sounds straightforward, but although modern digital television receivers can have facilities for interactivity, currently these are generally limited and far from ideal for sending anything other than the simplest of messages. A section of the Appendix to this report shows how Svenska Bostäder is working on the use of a TV as a home terminal.

The predecessor project to T-SENIORITY, 'Seniority',[12] provides an excellent working example of how broadband computing can provide genuine assistance to people with disabilities. It is a service platform based on the use of internet and open standards, which provides older people with customised user-friendly services to help them retain their independence and improve their quality of life. Probably the most important element of Seniority was the way in which a wide range of agencies and stakeholders were brought together to satisfy the different needs of a diverse array of different people, using telemonitoring and telecommunications devices. Due to the project's use of the internet, all those involved – older people and the agents and carers charged with looking after their needs – could be located anywhere in Europe. As a simple

[11] http://tseniority.idieikon.com.
[12] www.eu-seniority.com.

example, it could therefore be possible for UK people who have retired to live in Spain to stay in touch with their relatives or health service contacts (doctors, hospital) in the United Kingdom.

The idea is great, showing how technical and social cooperation can benefit older people, but the challenges of making the technology do what is required are also great. So far, there is no real 'two-way' communication from Digital Terrestrial TV (DTT) set-top boxes – current 'interactive' services are merely allowing the viewer to find the way to information through large numbers of pages continuously broadcast on a 'carousel' of thousands of pages. There have been technical trials of real two-way DTT services, DVB RCT[13] (Return Channel Terrestrial) with a mini-transmitter in the home sending signals back to the main TV transmitter via the receiving aerial, but there are many complexities involved, and any such systems are years away from being practical. Similarly, it is possible to send signals from a home dish back to the satellite, but this has so far been restricted to business data systems.

T-Seniority requires that a viewer will be able to send messages from the TV set, 'communicate with their relatives, friends and colleagues; ask for shopping, repairs, medical services, appointments, on-line banking or any other daily life activities, etc.' This requires proper two-way communication – which is fine for cable TV, which has two-way communication built in, and for satellite, with the return channel by telephone line that is common, even 'compulsory' on services such as SKY; so far, though, we haven't seen any high-speed broadband interaction.

The introduction of high-speed broadband throughout Australia could mean that such services become readily available. High-speed broadband, in parallel with off-air TV, will provide that missing return path giving the necessary two-way link. One of the applications of such a two-way link could be two-way video telephony using the TV receiver/monitor as the display.

The TV-based videophone

The coming of high-speed broadband needn't imply that all its applications in themselves are complex or computer based – one of the simplest possible ideas could turn out to be as unexpected a winner as the mobile phone or text messaging was. Imagine a system that allows grandma to call up any of her grandchildren on her TV screen merely by pressing a button on the remote control. No dialling, no playing with equipment – merely press button 1 to talk with Mary and see her on screen or button 4 to look in at what is happening at Freddy's birthday party. Videophones have been possible for years, and internet messaging services have allowed us to see and talk to our friends, but you have always needed to be comfortable with using a computer, which has prevented this becoming mainstream.

People with communication impairments could benefit greatly from video communication. This may be through their speech or movements being seen by the other party to assist with comprehension.

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[13] www.dvb.org/technology/fact_sheets/WP03_RCT.pdf.

Two-way video services via broadband would enable people with intellectual impairments to feel part of a community. These services could be linked to a video relay service with the option of automatic captioning. The intelligent agent in the system would determine how best to channel any communication.

> *High-speed broadband in Australia could make it the first country in the world to have nationwide videophones.*

Once someone has this easy two-way TV videophone capability, they are not restricted to social chats. There could be many health-care benefits, ranging from just being able to take a look at how grandma is looking and behaving to asking her to hold up her medicine bottle to the living room camera (built in to the TV or set-top box, of course) in order to read the dosage instructions to her. Similarly, it might be possible for her to show you cards or presents that she has received, bringing the family closer together and minimising feelings of loneliness or isolation. Ethical or 'snooping' concerns could be addressed by ensuring that users know how to switch off their camera equipment.

Medical services

In the twentieth century, Australia led the world in the provision of medical services to remote areas via its Royal Flying Doctor Service (RFDS), which brings both emergency medical aid and primary care to many people who live well away from population centres. As well as arranging for clinical visits by doctors, the service currently provides advice to people in remote situations via telephones, satellite-phones and portable video conferencing units, and allows for consultations to take place and for communication and support to rural doctors across Australia.

The introduction of high-speed broadband could revolutionise the RFDS. High-speed broadband services would make it much easier to carry out teleconferencing between doctors in different regions, and for the first time it would be possible to send detailed x-ray images or other medical scans from the remote area to specialist doctors elsewhere. Patients' medical records, including previous scans, could be made available anywhere (subject to the usual ethical considerations) and live moving pictures of patients could be conveyed to specialists in the major hospitals, allowing them to make remote consultations and to advise the remote staff on the most appropriate courses of action.

While all these things are simple and straightforward with current, easily available technologies, it is also worth considering some of the exciting future possibilities that technological developments may bring. Once a secure and reliable high-speed broadband network is established, it may be possible to introduce remote 'keyhole' surgical procedures, where a surgeon in Sydney actually controls a remote surgical apparatus in the outback, enabling the skilled and experienced specialist surgeon to cut away diseased tissue or insert a stent in a blocked artery from thousands of miles away. The movements of the surgeon in Sydney would be exactly reproduced by the equipment at the remote site, with the surgeon receiving video and haptic feedback in real time as he or she worked. Such a situation can only be envisaged with a high-speed broadband link providing 'real-time' communication.

Such broadband-related applications, although apparently primarily medical, could benefit people with disabilities. For instance, a blind mother who has problems describing her child's rash could use the high-definition video link to show the problem to the doctor. Similarly, such video facilities could help those who have problems articulating their symptoms to show these to the remote medical personnel.

Standard telephone banking has already proved useful to people who can't easily get to a branch of their bank, and the HSBC banking conglomerate is already trialling videocam services via high-speed broadband for some of its customers, allowing them to see their banking advisers when they are communicating with them online.

It could be envisaged that the use of the broadband services might actually provide cost savings for health services by reducing the need for doctors to fly (or travel by four-wheel drive) to patients, and by reducing inter-hospital transfers of patients. Proper remote examinations of patients by doctors could also remove the need for some patients to be moved to hospital altogether, by increasing a doctor's confidence in their own diagnosis in cases where a doctor who currently couldn't closely examine a remote patient might make the sensible decision to have them transferred to hospital for assessment.

Health services to the home

The European T-SENIORITY project has already demonstrated the advantages of enabling older people and those with disabilities to send messages from the TV set to communicate with their relatives, friends and colleagues, to make appointments with the doctor, to ask for shopping and repairs to household equipment, to carry out online banking, and so on. Many such services can be carried out using low data rate links, but once you have high speed broadband available to the home a much greater range of remote medical services could be provided, reducing the need for patients to have to travel to see the doctor. As well as 'face to face via videophone' consultations, which would allow the doctor to make a visual assessment of the state of the patient, it would be feasible for data from patient-worn monitoring equipment (heart rate, temperature, blood pressure monitors, etc.) to be transmitted continuously to the doctor's surgery, so allowing the doctor to 'keep an eye' on the patient's progress without the inconvenience to the patient of travelling to the surgery for a consultation lasting just a few minutes. Similarly, the doctor would be able to rapidly see x-ray pictures or test results carried out at the local hospital. All these improved communications would speed up the treatment received by patients.

Lip-reading possibilities

Given sufficient definition in the transmitted pictures, which will present no problem for a high-speed broadband system, users with hearing impairments could actually use videophone services to lip-read each other's conversations, providing a useful new service and a real additional benefit for users.

In mobile telecoms, video communications is really only currently feasible on 3G networks. Tests have shown that some 3G phones can provide acceptable signing.

E-government

The use of the internet to deliver government information and services has become widespread throughout many parts of the world, but there are still many instances where insufficient thought has been given to how older people and those with disabilities can make full use of these services. As one example, already quoted, the European Commission project T-SENIORITY is developing scenarios whereby government services and information could be delivered via two-way broadband-based systems utilising the user's television set as the information terminal.

> *The forthcoming Australian National Broadband Network could provide the capability to ensure that all users, whatever their abilities, can make full use of e-government services, and that consumers with disabilities are not disadvantaged by any form of 'digital divide'.*

Video Relay Services (VRS)

Video Relay Services (VRS) allow Sign Language users to make and receive phone calls. Text-based relay services have been available for many years, but the fact that all the communications must be typed leads to a lack of spontaneity and lack of fluency in conversation. VRS uses a television or a computer with a video camera device and a broadband (high-speed) connection to allow people who are Deaf or hearing impaired to communicate through the telephone system with people who can hear or with other Deaf people. The VRS caller generally contacts a VRS centre with a Sign Language interpreter – they communicate with each other in Sign Language through a video link. The interpreter telephones the person who the VRS user wishes to call. The Sign Language interpreter then relays the conversation back and forth between the parties – in Sign Language with the VRS user, and by voice with the called party. No typing or text is involved. A voice telephone user can also initiate a VRS call by calling a VRS centre.

VRS is a popular service where it is available, since it allows Sign Language users to communicate in their 'natural' language, so that they can fully express themselves through facial expressions and body language, which cannot be expressed in text. VRS calls can flow back and forth just like a telephone conversation between two hearing people, and the parties can interrupt each other, which isn't possible when using text relays.

Video relay services are available in several countries, with the largest number of users in the United States, where Sign Language users use VRS to make phone calls in almost real time, with services available in both English and Spanish.[14] Successful trials have taken place and services also exist in France, Germany, the United Kingdom and Sweden, which was the first country to implement a publicly subsidised VRS system.

[14] http://en.wikipedia.org/wiki/Video_Relay_Service#National_U.S._VRS_regulation.

Images transmitted by VRS need to be of good quality, and the international standards bodies ITU and ISO have shown that video via broadband can be more than good enough, with quality continually improving as transmission speeds increase and new coder/decoder software is introduced. It is notable that in some parts of the United States, dedicated videophones are provided to VRS users.

> *Australia's forthcoming high-speed broadband system should be ideal to provide a top-class service to Deaf VRS users, and a universally installed system could provide a service whereby Sign Language users could 'phone' each other directly, as well as using VRS to communicate with hearing people.*

Signing developments

Remote communication via signing could be made easier by developments in the United States, which use a special glove to convert American Sign Language into electronic text and speech using gesture-recognition technology.[15] Sensors (accelerometers) on each finger of the glove, and on the signer's elbow and shoulder, generate electrical signals from the movement and position of the hand and fingers in relation to the body. These signals are then analysed by a microcontroller to find the correct word associated with that particular hand movement, with this taking only milliseconds. This could help Deaf people to more easily communicate with the hearing world.

Multi-modal conversation

Some consumers with disabilities benefit from a combination of signing, lip reading, text display and enhanced audio. This type of multi-modal communication is sometimes referred to as 'Total Conversation'.[16]

Total Conversation effectively means a standardised concept where one can use video, text and speech at the same time. Deaf people, people with hearing impairments and Deaf blind people make especially good use of Total Conversation. People with communications impairments would also benefit from this multi-modal communication.

Video Remote Interpreting (VRI)

Video Remote Interpreting (VRI) is another method of enabling Deaf people to communicate with hearing people. VRI is often used for businesses and others who need the services of a Sign Language interpreter, perhaps at short notice or at locations where it is difficult to find an interpreter.[17]

With video remote interpreting, a Deaf person sits in a room with video conferencing equipment. The interpreter is not in the room, but appears on the screen from some

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[15] http://ieeexplore.ieee.org/xpl/freeabs_all.jsp?tp=&arnumber=1301590&isnumber=28919.
[16] www.itu.int/ITU-T/studygroups/com16/accessibility/conversation.html.
[17] www.nad.org/issues/technology/vri.

remote location. The remote interpreter listens to what is being said and interprets it into Sign Language. The Deaf person watches the interpreter on the screen. Likewise, the interpreter is able to see the Deaf person via the camera. The key difference between a VRS call and VRI is that the remote interpreter is effectively interpreting a normal telephone call made by one party to the other. A VRI interpreter is a substitute for a live, physically present interpreter, with the disadvantage that there is no person-to-person contact.

An example of early work in this field, the Siemens Elema project, is shown in relation to Sign Language interpretation in the workplace in the Appendix to this report.

Australia's National Broadband Network will be able to provide the required video services for VRI users.

Talking books – a significant improvement in the service

Access to talking books for people with a print impairment could change significantly by either providing a very fast download speed or by providing remote access to a central store of talking books. By interconnecting the central stores in different countries, it could mean having access to books and periodicals in a large range of languages. The projects described in the Appendix to this report show some ideas for technical implementations.

Converting printed text to the spoken word

Using a video camera, which might be part of a mobile phone, a remote character-reading system could convert printed text to the spoken word. Ideally, this should also be able to read instructions on medicine bottles or labels on packets of food. Another possibility would be for the bar code to be read remotely and a related database tell the individual the instructions for cooking or storage, or whether the product contains nuts. An additional feature might be the facility to provide output in a choice of languages.

Applications for employment and education

To enable a wide range of people with disabilities to be employed, it is important that they are provided with facilities that allow them to interact and hold conversations with others as easily as possible. To provide such access, the improved 'readability' and 'communications' facilities that broadband can provide will play a major part in improving employment and educational opportunities. For example:

- a blind individual could listen to a verbal description of a colleague's diagram
- interactive training from the office equipment manufacturer could help the user to make the best use of the equipment.
- a blind person could use a voice-recognition system to convert the speech of a colleague into data, which can be stored so that it can be retrieved as Braille for later use.

Smart living

The area of smart living could be transformed with the intelligence in the system being remote from the home; this will result in significant economies as well as allowing a range of new services. For someone with dementia, it might include the facility for a remote carer to provide assistance and advice when needed. As mentioned elsewhere in this report, such systems could also incorporate the remote monitoring of devices in the home, and the ability to run diagnostic tests remotely (thus saving significant time and money).[18]

> *With the planned legislated requirements in Australia for fibre to the premises in greenfield developments, together with the general commitment of fibre to the premises, innovative services can be provided to all residents.*[19]

This is especially the case in apartment buildings where everyone can benefit from in-built devices measuring the consumption of water, gas and electricity. The customer interface needs to be usable and accessible for all residents including older people and people with disabilities.

There can be a facility to offer, for example, remote monitoring of devices in the home and the ability to run diagnostic tests remotely. These devices could be the washing machine or refrigerator, saving time and money for residents if there is a breakdown.

In new retirement villages and homes generally, people could be assisted by a remote carer providing advice as required. This advice could be provided through video communication using the TV. It could be extended to regular video monitoring of people with dementia (taking into account privacy and consent) so that their safety and security are improved.

> *The paths to implementation in Australia should include:*
>
> - *government regulation to ensure that facilities in any greenfield developments are extended to enable provision of interactive services and usable and accessible interfaces for the consumer. Guidelines need to be developed for accessible customer-facing interfaces.*
> - *industry development of clear and simple remote control interfaces with large, well-spaced and well-labelled buttons as well as intelligently designed on-screen menu systems with displays that can be easily read and instructions that are simple and work the first time*
> - *government NBN funding for pilot projects to demonstrate socially valuable implementations of high-speed broadband.*

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[18] www.snapi.org.uk/cost219ter/making_life_easier/index.htm.

[19] www.dbcde.gov.au/broadband/national_broadband_network/fibre_in_greenfield_estates.

Ambient Intelligence

In the longer term, Ambient Intelligence systems could have a very significant impact on the quality of life of people with disabilities. Ambient Intelligence is where people are surrounded by intelligent intuitive interfaces that are embedded in all kinds of objects and an environment that is capable of recognising and responding to the presence of different individuals in a seamless, unobtrusive and often invisible way. Such systems will need to be unobtrusive, have natural interfaces, and be personalised, adaptive and anticipatory.[20]

With wireless systems, this could mean that someone with a disability could store their preferences in the system, and then in the event of a service disruption on public transport the individual could automatically be advised of an appropriate alternative route (coupled with guidance in the form of augmented reality) to their destination, taking into account their limitations (e.g. cannot comfortably walk up more than ten steps and 100 metres on level pavement).

At present, there is plenty of information available on the web about Ambient Intelligence, but very little that is strongly related to disability, although the two areas will undoubtedly be tightly interrelated in the future.

The European ASK-IT project has focused on the use of Ambient Intelligence in addressing the mobility needs of people with impairments, and the ASK-IT project uses the internet as an integral part of its communications platform. High-speed broadband would obviously be extremely beneficial in bringing these ideas to practical fruition.[21]

The European COST Action 219ter has produced a useful publication, *Ambient Intelligence. Paving the Way*, which discusses how integrated services can deliver a more inclusive society. Although it is not broadband specific, the section on delivering ambient intelligence systems to people with disabilities has significant relevance for the advantages that the provision of high-speed broadband service might bring to these groups.[22]

Mobile broadband

Many of the services for people with disabilities and older people who require broadband access would also be immensely useful if they could be extended to mobile phone users. Modern 3G phone networks can provide sufficient useful bandwidth/bit-rates to enable users to make use of videophone services, video relay services, access to e-government services, and so on. Currently announced plans for the Australian National Broadband Network are for fixed service fibre to the home and fibre to the building installations, but it might be worth introducing the possibility of extending these services in some areas to provide radio frequency access to the broadband network, either via 3G or Wi-Fi/WiMax as appropriate.

Mobile phones are currently being used to display ‘bar codes’ which can be used as machine-readable tokens to provide access to travel services or cinema ticketing

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[20] www.snapi.org.uk/cost219ter/ambient_intelligence.
[21] www.ask-it.org.
[22] www.snapi.org.uk/cost219ter/ambient_intelligence.

systems, for example, and this type of service is likely to grow. 'High definition' images via broadband connected mobile phones may allow sufficient definition for users to lip-read, and a camera in a mobile phone could read the bar code on a product, either from groceries in the supermarket or in the kitchen, or – perhaps more importantly – the labels on medicines. This data could then be sent to an automatic recognition database and the results read back to the user with vision impairment, enabling them to lead an independent and better quality life for longer.

Speed is the essence of such services, which are only useful if the information can be provided virtually instantaneously, so broadband would be essential; the introduction of the Australian National Broadband Network promises to be a significant enabler for many important services and applications aimed at assisting older people and consumers with disabilities.

Who will pay?

As Commissioner Michael J. Copps of the FCC states in his hearing for a National Broadband Plan:[23]

> Every American has to have access to this technology and all the many services its spins out. Because this is technology that intersects with just about every great challenge confronting our nation – whether it's jobs, education, energy, climate change and the environment, international competitiveness, health care, equal opportunity or overcoming disabilities. There's no solution for *any* of these challenges that does not have a broadband component to it – that's how important this stuff is.

In Australia, we already have the plans for a National Broadband Network, but we do not have a plan for meeting the broadband needs of consumers with disabilities.

The number of broadband applications and their benefit to consumers with disabilities and older people is large. Some are expensive and/or fit-for-purpose, while others make use of existing technologies and adapt them for increased accessibility.

The Australian government has an ideal opportunity to undertake and stimulate pilot projects as part of the implementation of the National Broadband Network to assess particular applications for their applicability to the Australian situation. A fund should be established for this purpose.

Industry should consider how it can profitably develop and market relevant applications that could find a valuable place in the Australian market. TV videophones are an obvious possibility.

The question remains, though: How can consumers with disabilities afford the various devices and services? We need to ensure that there is a subsidised program for equipment that goes well beyond the standard fixed phone. The current disability equipment program provided by Telstra and Optus has assisted consumers with disabilities to meet their basic telecommunications needs. The time is ripe for change and for an expansion of this type of program to provide for twenty-first century

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[23] http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-294550A1.pdf.

communications technologies. The Australian government needs to ensure that this will happen so that consumers with disabilities are not left out of the broadband revolution.

Conclusion

The National Broadband Network promises to be a significant enabler for many important services and applications aimed at assisting older people and consumers with disabilities.

There is a real need to go further than investment in the broadband infrastructure. Government support is vital for applications that enable the Australian community – including consumers with disabilities – to obtain maximum benefit from the National Broadband Network.

But we must remember that consumers with disabilities have to be an accepted and respected part of the building blocks, the planning and the implementation for the applications to be truly successful. It is important to work towards an answer to the question asked by Goggin and Newell:[24]

> How can we bring about a future in which disability in its digital incarnations may unfold in new, unexpected, and fairer ways to the genuine benefit, and with the assured, ubiquitous participation and imaginings of people with disabilities?

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[24] Goggin, G. & Newell, C. (2003) *Digital disability: The social construction of disability in new media*. Lanham, MD: Rowman and Littlefield, p. 154.

APPENDIX: FURTHER INFORMATION ABOUT HIGH-SPEED BROADBAND APPLICATIONS

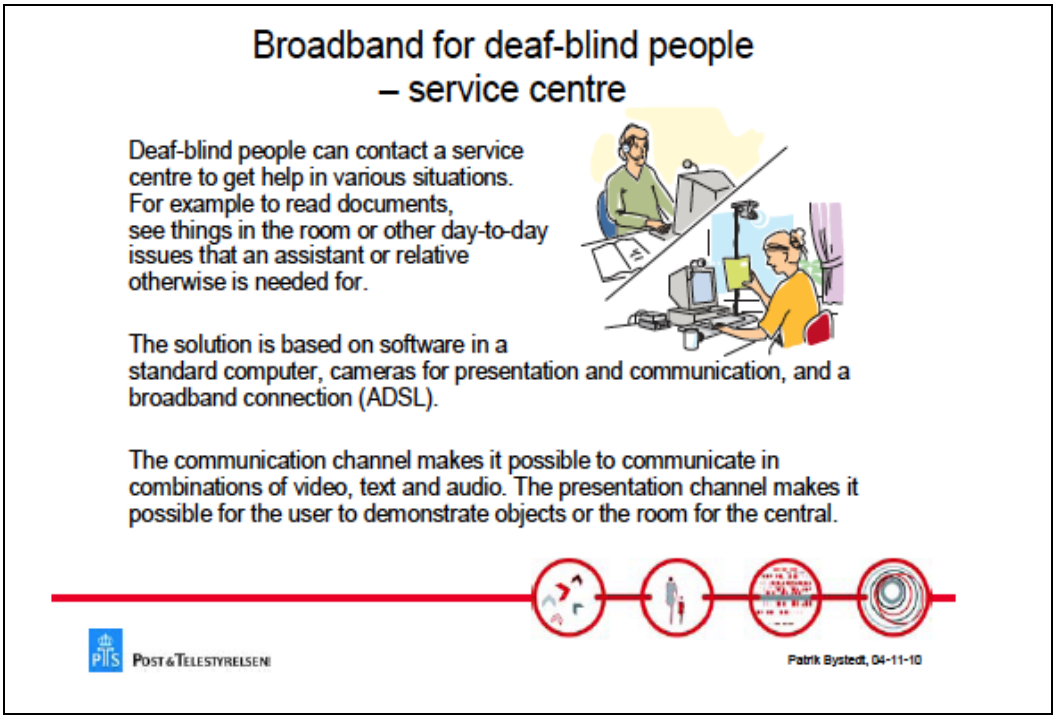
1. Service centre for Deaf-blind people

The project is a kind of 'remote eye' for people who are blind or Deaf-blind. A webcam is installed in the home of the blind person and connected to a monitor at a service centre. The camera can be operated (moved) at the service centre. The customer can call the service centre and ask for help – for example, ask staff to check the colour of a tie or describe the picture on a postcard. The information can be provided either by voice or as text on a Braille display.

In summary:

- Deaf-blind people can contact a service centre to get help in various situations. For example to read documents, see things in the room, or other day-to-day issues that an assistant or relative otherwise is needed for.
- The solution is based on software in a standard computer, cameras for presentation and communication, and a broadband connection (ADSL).
- The communication channel makes it possible to communicate in combinations of video, text and audio. The presentation channel makes it possible for the user to show objects to people in the service centre.
- It should be emphasised that the solution is based on standard components – it is based on ordinary equipment.

Further information is available from:
www.snapi.org.uk/cost219ter/inclusive_future/inclusive_future_ch2.htm#section23.



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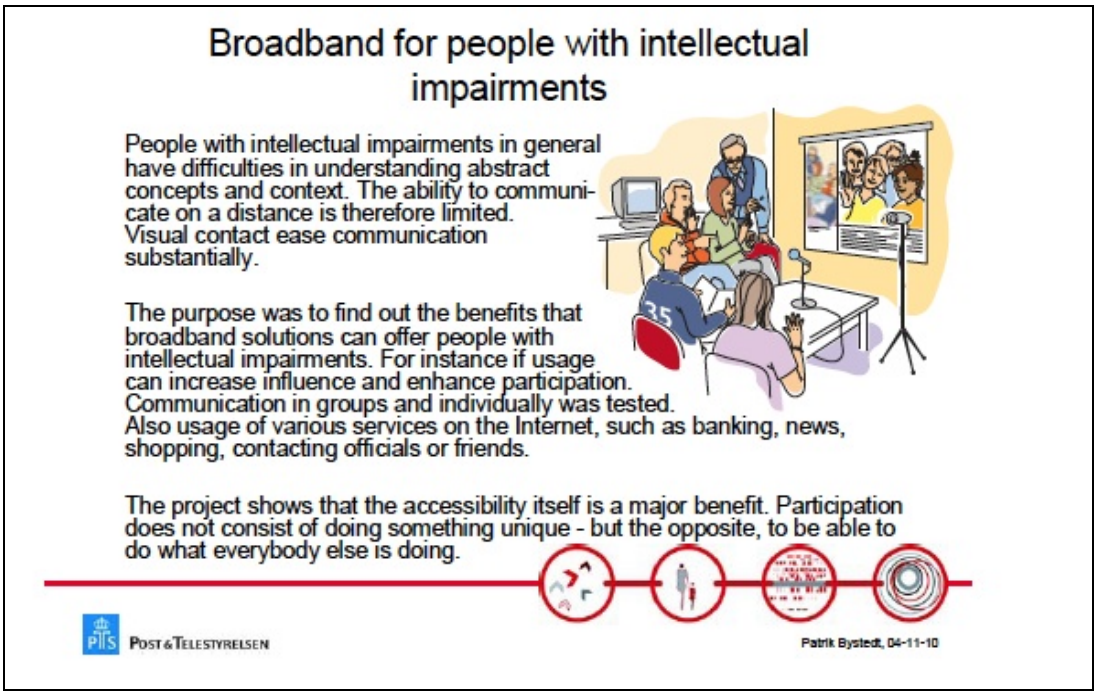
2. Communication for people with intellectual impairments

It is well known that people who have intellectual impairments and developmental delays have difficulties using ordinary telephones because they may not understand abstract concepts. They benefit from seeing the person to whom they are talking or from seeing articles and objects spoken about. Broadband communication to the home allows users to see each other as well as to talk, and to use video conferencing techniques to connect them to groups of people with disabilities. Staff in the service centres can also communicate with their clients in a much better way than they could using an ordinary telephone.

In summary:

- People with intellectual impairments in general have difficulties in understanding abstract concepts and context. The ability to communicate at a distance is therefore limited. Visual contact eases communication substantially.
- The purpose of the project was to find out the benefits that broadband solutions could offer people with intellectual impairments – for instance, whether usage could enhance participation. Communication between individuals and in groups was tested, as was usage of various services on the internet, such as banking, news, shopping, and contacting health professionals or friends.
- Participation does not consist of doing something unique – rather the opposite: to be able to do what everybody else is doing.

Further information is available from:
www.snapi.org.uk/cost219ter/inclusive_future/inclusive_future_ch2.htm#section23.



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4. Distance education for people with mild aphasia

For people with aphasia, the possibility of combining pictures or video with speech is important for successful communication.

One project tested suitable forms of distance education using the best available broadband solutions. The solution was simple: a standard computer with video conferencing software, web camera and an ADSL connection.

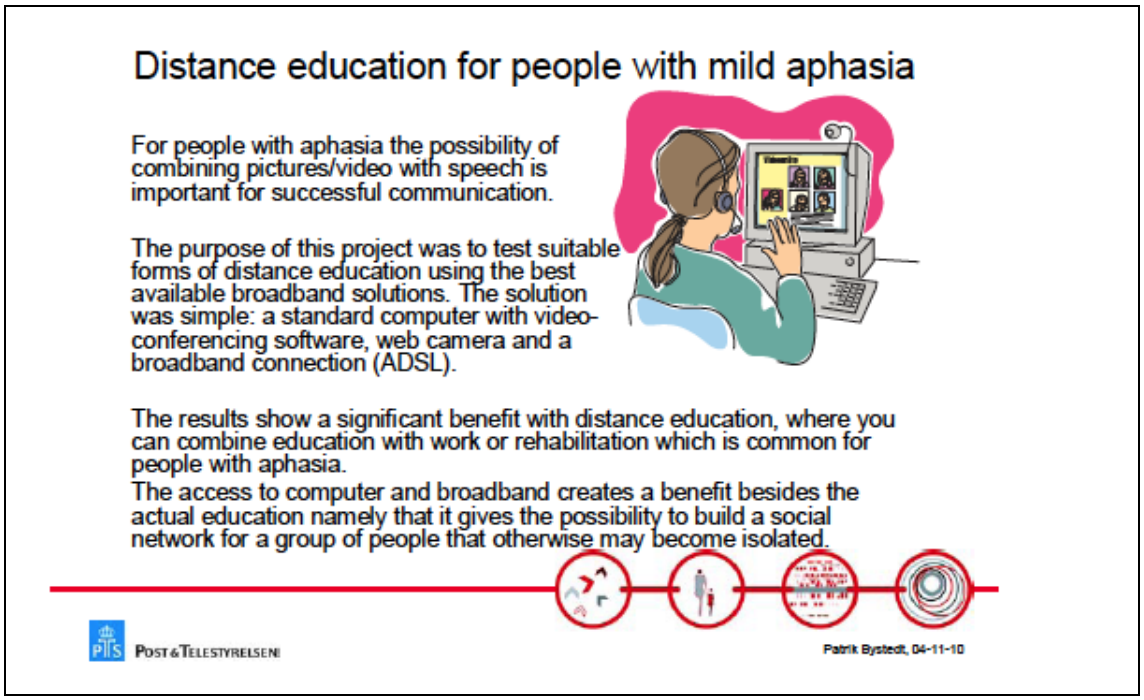
The results show a significant benefit, with distance education combining education with work or rehabilitation, which is common for people with aphasia.

The benefits go beyond distance education, with the possibility of creating a social network – something that is often difficult for people with aphasia.

In summary:

- Eight people participated in the trial.
- Regular tuition was provided three times a week, with positive results.
- The social aspects of being able to use video-conferencing to communicate with other people with aphasia outside the teaching sessions were found to be beneficial.

Further information is available from:
www.snapi.org.uk/cost219ter/inclusive_future/inclusive_future_ch2.htm#section23.



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5. Distance education in Sign Language

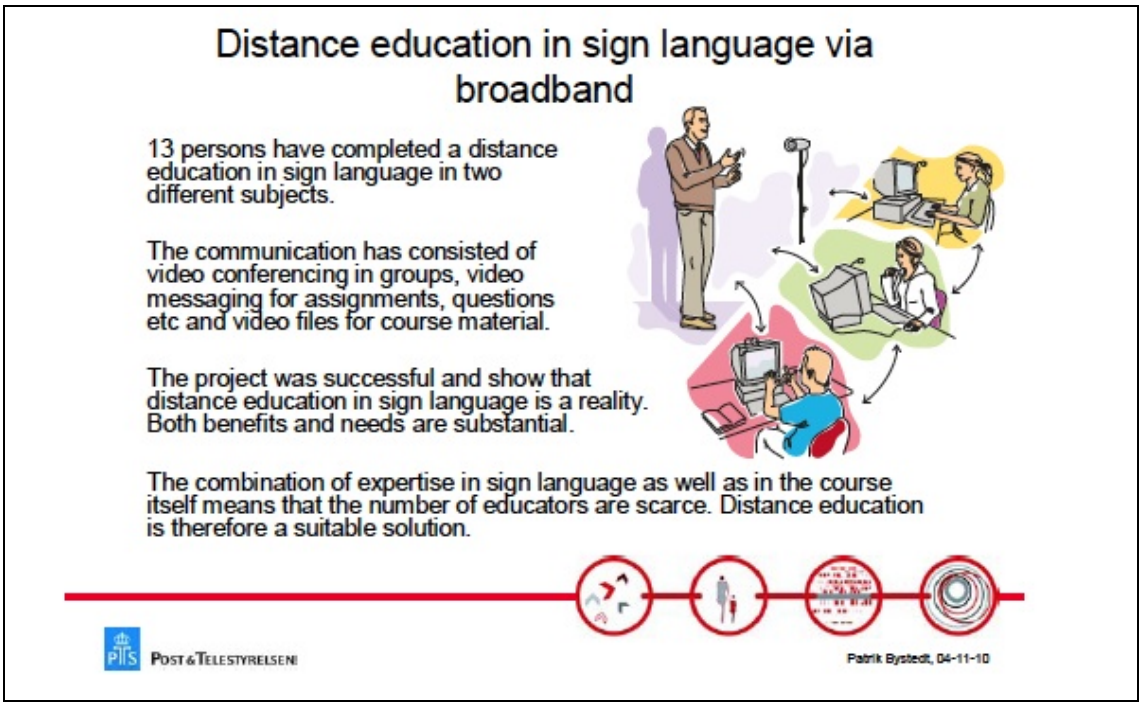
In most countries, Sign Language interpreters are scarce. It is therefore difficult to teach people Sign Language or to teach subjects using Sign Language.

A small number of people who would like to learn Sign Language or learn a special subject via sign language have been provided with video terminals. They have a broadband connection to a centre where a teacher is teaching Sign Language or a specific subject.

In summary:

- Thirteen people have completed distance education in Sign Language in two different subjects.
- The communication has consisted of video conferencing in groups, video messaging for assignments, questions, and so on, as well as video files for course material.
- The project was successful and shows that distance education in Sign Language is a reality. Both benefits and needs are substantial.

Further information is available from:
www.snapi.org.uk/cost219ter/inclusive_future/inclusive_future_ch2.htm#section23.



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6. Distance occupational guidance

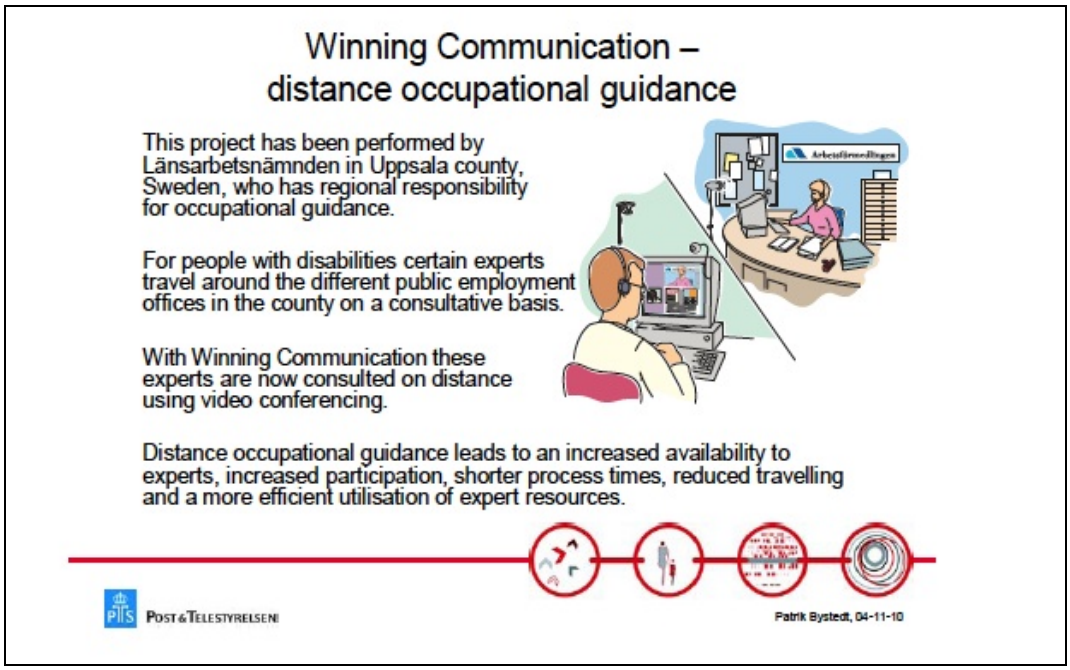
When a caseworker, together with a jobseeker, has identified a service need and decided what method would be appropriate, the jobseeker can be offered a meeting with an expert at a distance via video communications. In concrete terms, this means that the applicant, together with his caseworker, will meet, for example, a psychologist, teacher of the deaf/hearing impaired, vision consultant, occupational therapist or other expert via video communications. Following each video communication session, the users/caseworkers can be requested to complete an appraisal form that functions primarily as a log for statistics but also as a brief evaluation of the technology and environment in the meeting.

Another form of guidance is where the jobseekers, together with the caseworkers, meet experts for consultation. This is the case regarding counselling through a solution-focused working method and group guidance.

A video communications solution can also be used in the employment office's internal work, such as network meetings, information sessions, development of skills, counselling, and so on.

Further information is available from:

www.snapi.org.uk/cost219ter/inclusive_future/inclusive_future_ch2.htm#section23.



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7. Mobile Sign Language communication

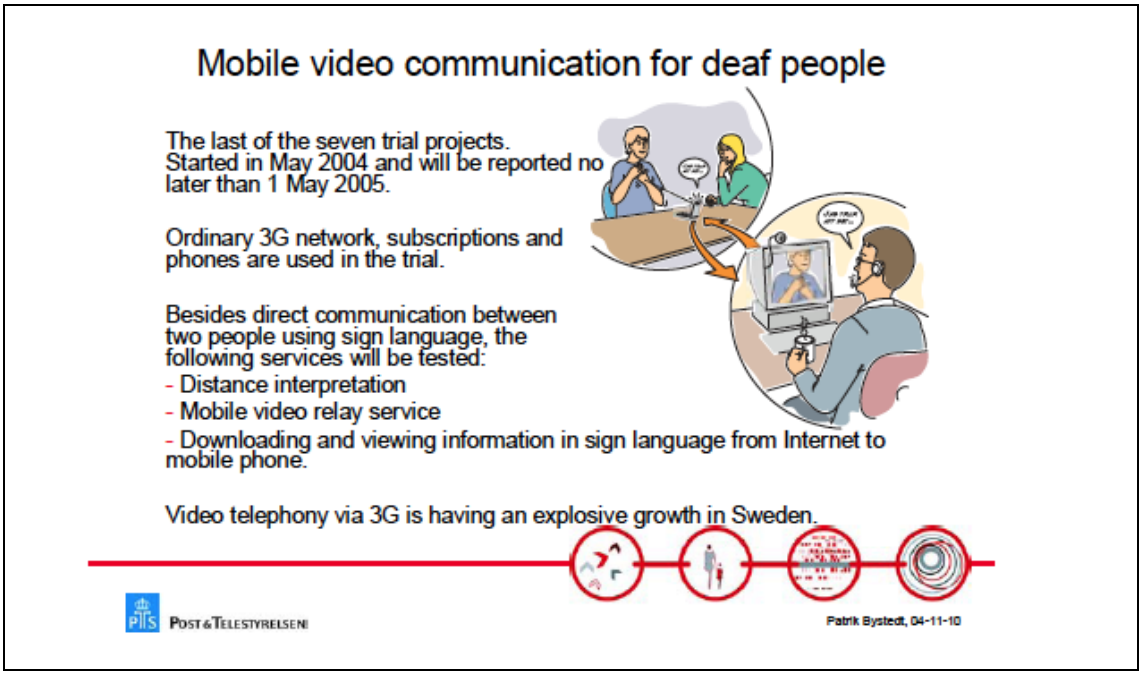
This service concerns the use of mobile Sign Language communication over the 3G network.

The company '3' in Sweden provided a number of Deaf young people in that country with free mobile 3G telephones in 2004 as part of the project. The project was an agreement with a Sign Language interpretation centre.

In summary:

- Ordinary 3G network, subscriptions and phones were used in the trial.
- Besides direct communication between two people using Sign Language, the following services were tested:
  - distance interpretation
  - mobile video relay service
  - downloading and viewing information in Sign Language from Internet to mobile phone.
- Video telephony via 3G has experienced explosive growth in Sweden.

Further information is available from:
www.snapi.org.uk/cost219ter/inclusive_future/inclusive_future_ch2.htm#section23.



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8. SYNFACE – An animated talking face for lip-readers

Many people with hearing impairments rely on lip-reading during conversations, which makes it difficult for them to communicate over the telephone. SynFace is a technology that allows an animated talking face to be controlled by the incoming telephone speech signal in real time. The talking face facilitates the understanding of speech by providing lip-reading support. This method works with any telephone and is cost-effective compared to video telephony and text telephony, both of which need compatible equipment at either end. The SynFace technology has many other potential areas of application – for example, in the areas of education, entertainment and public information systems.

The development of the SynFace technology was funded by the EU IST program (project no. IST-2001-33327) between 2001 and 2004. A multilingual, real-time prototype of the SynFace talking head telephone was developed and evaluated by hearing-impaired users in Sweden, Holland and England with positive results.

There are a number of current developments, with the SynFace technology presently being employed in several contexts:

- The EU project Hearing at Home (H@H) includes Synface technology as an integral part of the project.
- SynFace is used a platform for research in speech perception and multimodal interaction.
- Start-up company SynFace AB is marketing SynFace Technology to the hearing market as well as in other domains.

Awards and invitations include the following:

- SynFace was prominently exhibited, by invitation, at the EU conference ICT for an Inclusive Society in 2006.
- SynFace was invited by the European Commission, Directorate-General for Research Information and Communication Unit to participate at the exhibition *Today is the Future – 07* in 2007.
- Jonas Beskow was awarded the Xerox Chester Carlson Research Award for his work on SynFace in 2006.
- SynFace AB was selected as one of the winners in Vinnova VINN NU competition in 2006.

Details are available from: www.speech.kth.se/synface, Kungliga Tekniska Högskolan, Dept. Speech, Music and Hearing. Inger Karlsson Tel. (46-8) 790 7563 Fax (46-8) 790 7854 inger@speech.kth.se, Lindstedtsvägen 24, SE-100 44 Stockholm, Sweden.

9. MonAMI for ambient intelligent systems at home

The MonAMI project will first select groups of services to support people at risk of exclusion and loss of autonomy. Step two is to construct, test and deploy these services and demonstrate that they can be economically mainstreamed into future ambient intelligence technologies.

The objective of the MonAMI project is to demonstrate that accessible, useful services for older people and people with disabilities living at home can be delivered in mainstream systems and platforms. This will be done in close cooperation with users and by involving key mainstream organisations throughout the whole process.

Services in different sectors

The selected services and applications will be developed with a Design for All approach together with potential users in the following areas:

- comfort applications: home control, personalised communication interface, activity planning
- health: monitoring, medication
- safety and security: safety at home, visitor validation, activity detection
- communication and information.

Current state of research

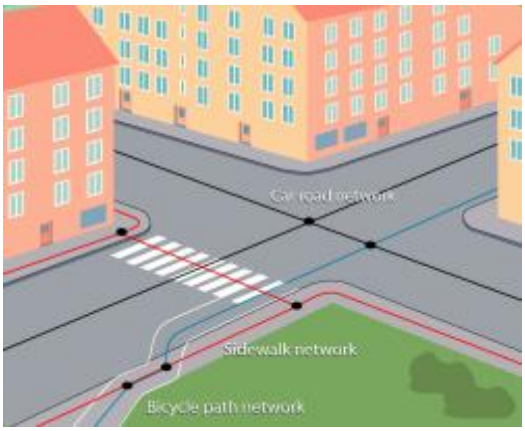
Previous European projects have shown that technological augmentation of the living space can help to alleviate problems by supporting daily living tasks and increasing quality of life, thus reducing the need for institutional and other care. So far, the results of these projects have often remained in the laboratory or only been implemented on a small, local scale.

The main innovation of the MonAMI project lies in demonstrating how a complex mix of technologies, many of them so far only validated under laboratory conditions, can be brought together in a socially and economically viable way to facilitate inclusive access for older and disabled citizens.

This involves an improved understanding of how new technologies fit into the social and economic framework, tailoring systems and interfaces specifically to the requirements of the older and the disabled as well as adaptation and integration of emerging technologies. Although the project does not focus on technology development, the required adaptation and integration work, as well as the experience to be gained from real-world deployment, will result in significant technical innovations.

Further information is available from: www.monami.info.

10. e-Adept: Planning, navigating, travelling, reporting



e-Adept is a unique cooperative project within the areas of personal navigation, travel planning and safety. The aim of the project is to provide a mobility-enabling solution to increase pedestrian accessibility for older people and people with disabilities.

The service facilities are offered via a mobile telephone or PDA with integrated telephony capabilities. Positioning equipment is connected to the hand unit. The positioning unit is based on GPS and inertia navigation equipment. The combination of these technologies allows for navigation in both urban areas and indoors.

Unlike several existing navigation solutions, e-Adept is based on a digitalised road network for pedestrians and cyclists. Combined with a precise and reliable positioning system, the e-Adept solution provides a much more detailed route indication for the pedestrian user than would the use of road maps aimed at automobile drivers. The pedestrian route network also makes it possible for the user to be guided along sidewalks, pathways and pedestrian crossings.

The pedestrian route network used for the route planning is owned and administered by the municipalities. This ensures that data are continuously updated in accordance to the daily activities of that municipality. Auxiliary information can be uploaded to the network, such as temporary road construction work, location of seasonal outdoor restaurants or sidewalk restaurant seating, and the position of stairs.

The calculation of optimal routes and the subsequent visual/audio presentation to the user are based upon individual user profiles. The user can be warned about a certain kind of obstacle or can get information about how to avoid these obstacles by choosing another route.

The system is continuously fed with relevant information from the municipality and can also retrieve information from various travel planners for public transport. This makes it easier for the user to plan his or her route from door to door via walking or using public transport.

e-Adept is a user-focused solution. The e-Adept solution has been developed after numerous tests with specific target groups and ongoing testing to ensure that the solution is meeting the needs of the applicable user base. In order to make the service facilities as efficient and user friendly as possible, the system can be adapted to a specific target group and to actual individual needs.

For the safety of the user, support functions are integrated in the e-Adept system. These support functions enable the user to contact relevant emergency services. In addition, passive alarm functions will detect if the user falls, deviates from a given route or does not move for an unusual length of time.

The e-Adept solution has been successfully tested in Stockholm, among other locations, and further work with e-Adept is ongoing in several municipalities. The intention is to offer this service in most parts of Sweden and possibly even on an international basis. Various companies will be given the possibility to develop and offer service facilities built on the concept of e-Adept, with open interfaces and a consistent geographical infrastructure.

In summary:

- The project offers support for enabling complete journeys, adapted to the ability of the individual.
- The main target groups are people with cognitive impairments, older people and people with vision impairment.
- The system uses mobile telephone/PDA with integrated telephony communicating with a server.
- It uses GPS and inertia navigation for positioning.
- It enables navigation indoors as well as outdoors.
- Travel planning and guidance are provided in combination with public transport.
- There is the possibility to send an alarm for assistance and emergency situations.
- The systems offers the possibility of reporting information to a central system.

Further information is available from:
www.eadept.se/Templates/Article0.aspx?PageID=618ea136-9f01-4172-b03a-0852776c65c7.

11. Streaming reading: distribution of digital talking books

Swedish National Post and Telecoms agency PTS is running a number of trials in collaboration with the Swedish Library of Talking Books and Braille (TPB). Streaming reading of talking books over the internet means that borrowers can use an internet connection themselves without needing to go to the local library in order to download a talking book. The trial includes downloading to mobile telephones. In the case of streaming reading, special reading software with synthetic speech is used. The Swedish Library of Talking Books and Braille is investigating the possibility of developing its digital lending service into a national distribution system. There are also trials in progress to convert official government ('SOU') reports into digital form.

Several trials have been carried out with both computers and mobile phones, using the software Net Plextalk. A commercial actor, Storytel AB, has been involved in the project.

Example of a portable recorder

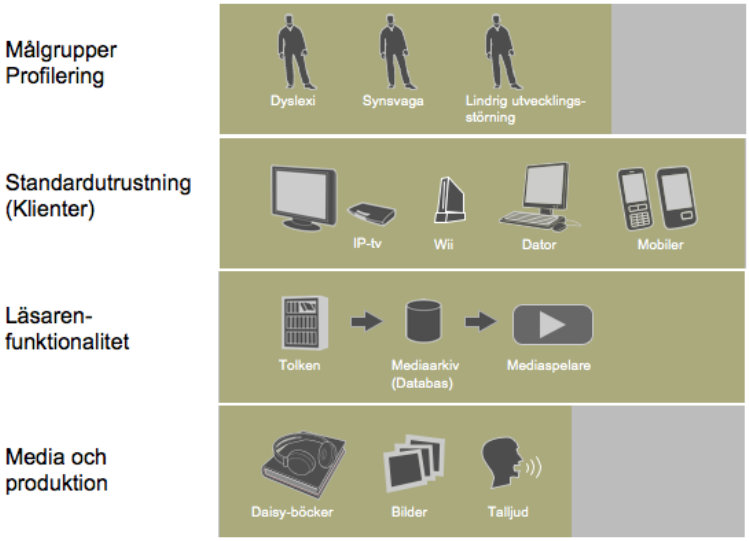
Reproduced with permission from PTS.

Further information is available from:

www.pts.se/upload/Rapporter/funktionshinder/Strommande-lasning-etapp-2 (Swedish)
www.tpb.se/english
www.tpb.se/forskning_utveckling/bredbandsprojekt (Swedish)
www.webfinanser.com/nyheter (Swedish)

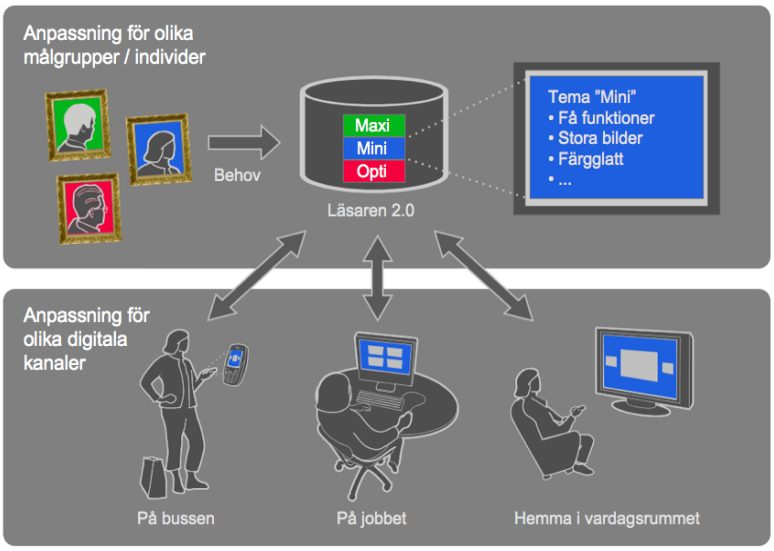
12. Streaming reading on broadband television and mobile telephones for people with a reading disability

This project involves testing streaming information in a format where users can operate and navigate the service directly from a web page, mobile telephone or television. The aim is for users to be able to receive information on the basis of their unique needs in the form of text, audio and images or a combination of them. For example, it should be possible to listen to a talking book while the print is displayed in any size, font, contrast or having the content clarified with the help of pictures.



Target groups (profiles), standard equipment (clients), reader functionality, and media and production

(From the report *Vidareutveckling av läsaren* [Continuing development of the reader)



Conceptual layout

Adaptation for different target groups/individuals and adaptation for different digital channels

From the report *Vidareutveckling av läsaren* (Continuing development of the reader)

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References

Kerstin Ivarson Ahlstrand and Davidsson, M., e-Centret Stockholm AB Ted Björling, Accedo Broadband AB and Alex Jonsson, Mobile Sorcery AB: *Vidareutveckling av Läsaren*. E-Centret, Vällingby, December 2009

To Me Group: Projekt Sofia – slutrapport etepp 1. PTS, 2009

Further information available from: www.pts.se.

13. Swedish Homes Inc (Svenska Bostäder AB - SB) – broadband applications

Svenska Bostäder AB (SB) is the largest real estate company with rental apartments in Sweden. SB is owned by the City of Stockholm and has approximately 31,000 flats and 5,000 premises, all located in the Stockholm area.

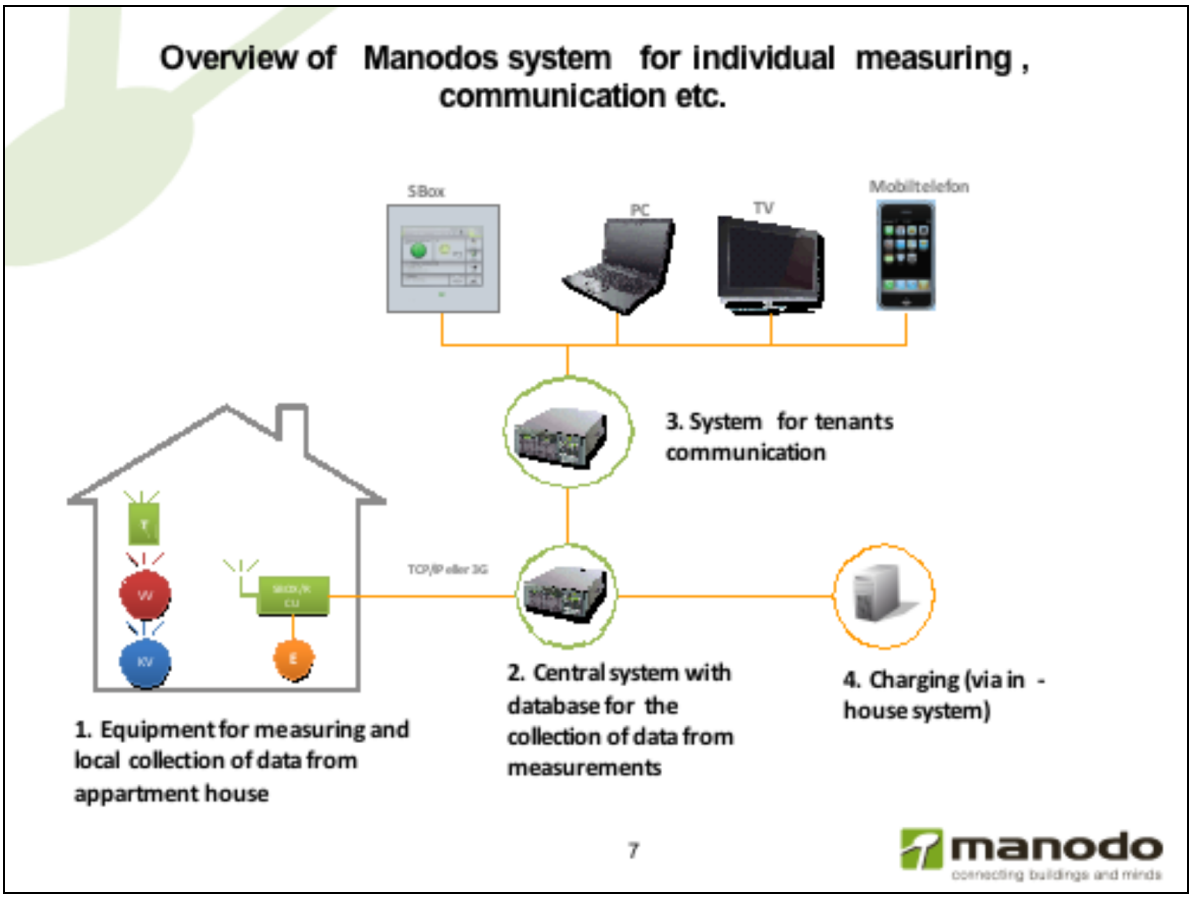
Today, about 20,000 SB apartments have access to a fibre optic network with the capacity of 100/100 Mbps. This capacity can be extended as demand grows.

SB Broadband is an open network with access to different suppliers and operators, with different kinds of services. The aim of the development has been to adhere to the Universal Design concept – that is, the various service facilities should as far as possible be accessible to all tenants. This includes older people and people with mobility problems, thus allowing them to obtain internal and external information without leaving their apartments.

Project SBox

SB has developed a unique version of a 'smart' pointing screen, called SBox. This screen is situated in the entrance hall and provides information about consumption of water, electricity, and so on, and offers various kinds of services to increase the level of security. A house telephone service with camera, laundry booking, error reporting, cooker-guard, traffic information, digital market information, and so on is also available.

Example from first page of SBox with shortcuts to the most important functions



SBox is part of a communication network, developed by Manodo Inc in Sweden. The Manodo SBox is equipped with a touch-sensitive screen that is installed in the hallway for quick access to various broadband-based service options. SBox is connected to a server via broadband, making it easy to upgrade and add new functions whenever the tenants wish.

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E-TV

SB has also run several development projects, the aim of which has been to TV-adapt parts of the SB customer web in order to increase the accessibility and use of broadband services.

Almost all tenants have an ordinary TV at home, in contrast to computers and internet access. The goal is to make the home TV a substitute for a home computer and thus give access to SB's web-based service as well as other services.

Further information is available from:

www.svenskabostader.se

www.mando.se

14. Sign Language interpretation in the workplace

A number of Deaf people have been employed at Siemens Elema manufacturing plant in Solna, Stockholm. For several years, the tasks to be performed were fairly static and well adapted to the employee, but during the 1990s, technical development became faster and so the need for retraining and interaction with the work leaders increased. This complicated daily work life, as the instructors did not know Sign Language and the workers were not good at lip reading or interpreting written messages. Also, written communication was too slow.

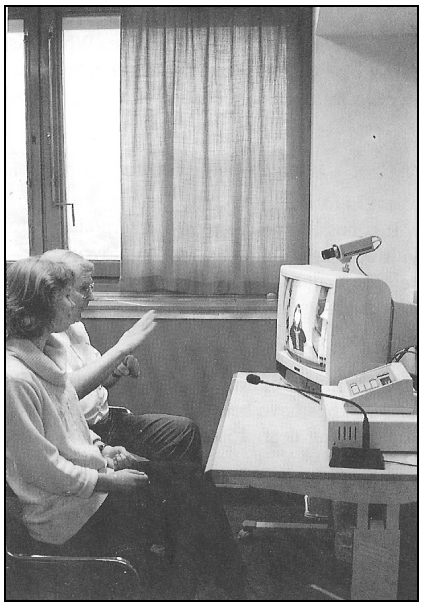
The method used to overcome the problem was to call for an external Sign Language interpreter on each occasion. This proved to be a time-wasting and expensive solution, however, and therefore a technical method was looked for.

The solution was to arrange for broadband video connections between the factory and an interpretation centre – or centres, where there were Sign Language interpreters who had some basic technical knowledge.

On the work site, mobile terminals were developed – that is, video equipment on wheels that could be moved around in the plant and put close to a certain machine operated by a Deaf worker. The dialogue could then take place in real time as with a Sign Language interpreter in the room.

The remote Sign Language interpretation was also used in conjunction with presentations to a large group of workers in a lecture hall, where the hearing staff listened to the manager and the Deaf group looked at a monitor in the hall.

The method was much appreciated and was used as long as the factory was in operation.



Work site with a Deaf employee asking questions via Sign Language to an expert using the remote interpretation centre (seen on the screen)

References

Pereira, Leonor Moniz and Lindström, J.I., *Videotelephony for Disabled and Elderly People*, pp. 21–3.

COST 219 Working group on Videotelephony. Commission of the European Communities 1994.

15. Emergency messages by Sign Language for Deaf people

The speedy transmission of emergency messages such as warnings about severe weather conditions, earthquakes, tsunamis and forest fires is important for everyone in the areas affected. Such messages are issued through radio and television broadcast stations, but can be difficult for Deaf people to understand, perhaps leaving them without the appropriate sense of urgency.

In Japan, experiments have been carried out whereby Japanese Sign Language messages are sent to people's computers and mobile phones. Much work has been done on the human factors involved in enabling a signer to express these urgent messages in a natural manner and, equally importantly, to ensure that the meaning of such messages is conveyed as quickly and clearly as possible. Sign Language requires both hand signals which can be conveyed relatively easily over systems using small-sized mobile phone displays, and facial expressions, which require the user to see much more detail, especially as facial expressions often indicate the degree or severity of an action or event, so that an expression would vary according to the magnitude of an earthquake or the severity of a fire outbreak. A modern high-speed broadband network could provide the capacity to transmit relatively high-definition Sign Language messages using both manual and detailed facial expressions, with sufficient detail for these to be read easily from a mobile phone screen.

Animated signing could be provided for this, one advantage being that the generation of such messages could take place in advance, and could certainly be created and edited quickly. An alternative idea is that the speed and capacity of a broadband network could make it possible to send high-quality video pictures of a real signer directly to mobile phones connected to the network.

Published with the permission of the JSL/Japanese Earthquake Messages for Deaf People. Kazuo Kamata, Utsunomiya University, Utsunomiya, Japan; Shunichi Yonemura, Shin-ichiro Eitoku, and Masakatsu Aoki, NTT Cyber Solution Labs., Yokosuka, Japan. Email: Kamata@is.utsunomiya-u.ac.jp.

References

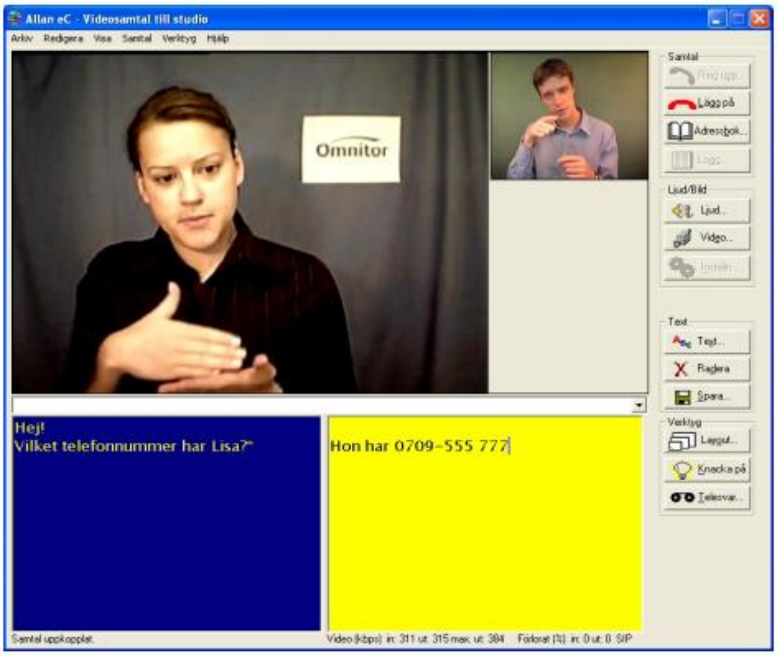
Kamata, K., Shionome, T., Yamamoto, H. and Fischer, S. (2005). A study on signing picture size and mobile communication services. In A. Purski and H. Knops (eds), *Assistive Technology: From Virtuality to Reality* (AAATE2005), Amsterdam: IOS Press, pp. 642–6.

Research Journal on the Problems of Sign Interpretation (2005), Special issue on Hearing impaired/Deaf people and countermeasures against natural calamities, no. 93, pp. 31–61. (in Japanese)

Yonemura, S, Eitoku, S. and Shimokura, K. (2007). *Urgent information presentation Using Listed Sign Language: Lecture Notes in Computer Science*. Berlin/Heidelberg: Springer, pp. 824–30.

16. Multi-modal communication terminal for Deaf people and people with hearing impairments

Total Conversation



Total Conversation is a standardised concept in which video, text and speech are used at the same time. Deaf people, people with hearing impairments and deaf blind people have especially great use of Total Conversation.

Total Conversation is standardised in the 3G-mobile organisation 3GPP (www.3gpp.org) and in the telecom standard organisation ITU (www.itu.int), as well as the internet standard organisation IETF (www.ietf.org). The 3GPP standard has also been acknowledged by ETSI.

The multi-modal terminal Allan eC (an acronym for 'All languages electronic Conversation') offers a unique possibility to use picture, text and speech simultaneously in a telecom-based conversation. One can choose the most suitable mode. It is designed for communication over the internet and other networks using Internet Protocol. Allan eC is a multimodal system that suits all. It is specially suitable for people who use Sign Language.

Allan eC complies with international standards for Total Conversation with picture, text and speech simultaneously, developed with the need of people with disabilities in mind but integrated in the common standards for video communication. The computer utilised for Allan eC can even be used as an ordinary office computer for word processing and internet surfing. There are several versions of Allan eC: as an add-on to an ordinary computer, a stationary Allan eC computer and a laptop version.

Further information is available from: www.omnitor.se/sve/allan_ec.html

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