

# The Digital Divide - Services for the Elderly and Disabled in 2010 – The PRISMA project

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## Abstract

What electronic services and devices will be available to support independent living in 2010? How can we ensure that the elderly and disabled are not isolated from society, victims of the digital divide? Will the computer and telecommunications be the perfect tools to help the disabled to finally get into the normal labour market?

These are just some of the questions that the IST PRISMA<sup>1</sup> project is trying to answer. The communications revolution has created multiple digital divides. Services in the Information Society need to be adapted to the needs of the elderly and disabled as highlighted in the eEurope initiative.

There is a socio-economic trend towards a service-oriented Information Society in Europe. The main aim of the PRISMA project is to help improve future service delivery across Europe by developing innovative service and thematic models for the provision of general interest services. The project covers all areas of Key Action 1 in the IST programme, addressing citizen services in the areas of health, persons with special needs (including the disabled and the elderly), administrations, the environment, transport and tourism. This paper reports on the work related to the elderly and disabled.

**Key words:** Elderly; disabled; digital divide, future services.

## 1. What is the digital divide?

eEurope's objectives are to accelerate the development of the information society in Europe and to ensure its potential is available to everybody – all Member States, all regions, all citizens. The eEurope initiative was launched by the European Commission in December 1999 with the objective to bring Europe on-line.

A Commission document in March highlighted the fact that as the Information Society advances it becomes more important to ensure that disadvantaged people are not left behind. The emerging risks of digital divide underline the urgency of preventive actions for specific target groups mobilising both public and private actors. A 'Social Inclusion Process' has been launched to fight against poverty and social exclusion in Europe. One of its key objectives is e-Inclusion which aims to fully exploit the potential of the knowledge based society and ensure that no-one is excluded from it, taking particular account of the needs of people with disabilities.

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There is a growing number of people who dispose of a fairly high amount of money, compared with a growing number of people who find it increasingly difficult to finance their daily needs either because of unemployment or because they have a job which does not provide sufficient income. At the richer end, one can expect to find increasing use of e-services, including tele-services, like tele-shopping and other personal and household services. At the other end of the scale, the less well-off, for example unemployed people, young parents, typically mothers, try to find second jobs and part time occupations, such as in call centres and home-based telework.

There is a particular danger of exclusion of elderly people from new communication technologies and services as the fundamental values of the language of ICTs “are essentially those associated with the world of youth” [Breton et al. 1999]. Measuring the Information Society shows that “older Europeans (55 years and older) are particularly resistant to having an Internet connection (and PC) at home” [INRA (Europe) 2000, 13]. However, in the light of the need for an “older workforce” [Institute for Prospective Technological Studies 2000, 30] in the future, a “digital age divide” must be prevented, for example, by providing elderly-friendly user interfaces, public Internet access points and computer literacy training to increase the skills of elderly people. Data security and protection of privacy are also especially important for tele-care.

## **2 What are the current services available for the elderly and disabled?**

ICT services for the elderly and disabled tend to be very specialised e.g. offering specific support for a particular disadvantaged group of users e.g. the blind or those in wheel chairs. In order to provide a composite picture of current service provision for the elderly and disabled we have drawn material from many sources.

The starting point was to look at services that provided independent living for the elderly and disabled and then to broaden out to look at more specific services that use ICT for assistive technology.

In order to provide coverage of services for people with special needs we have looked at projects/cases from the following areas:

1. Care Services
2. Smart Homes
3. Web
4. Mobile
5. Assistive Technology

### **2.1 Care Services**

One set of trials looking at this was conducted under the EU TEN TELECOM programme. The project was called TENCARE. The overall objectives of TEN-CARE were to establish a comprehensive and integrated technical, organisational and process-oriented approach to the care of older people and other patients at home, and to launch viable segments of the approach as independent businesses and/or operational services in the European healthcare market, setting up on a European scale a set of services for delivering or improving primary healthcare particularly for old people, based on advanced telematics. The approach aimed at providing for patients as complete a continuity of care as practicable, removing for healthcare providers extremely costly duplication of effort at transitions, enabling low-cost and effective care delivery, and developing new business for advanced network service providers by supporting transitions between home-based care and hospital or other institutional care. For example one trial looked at supporting mobile workers in the field of social care. The system helped the mobile workers to better co-operate and interact with the local and professional departments on the one hand and a new

implemented service centre on the other hand. Another trial looked at providing an accessible information database to home carers and patients from their TV via the internet.

The TEN-CARE project was very successful. It provided user-oriented, organisationally and technologically integrated applications and services, meeting the needs of patients and care providers. Many of the services have continued after the life of the project.

## **2.2 Smart Homes**

In order to provide independent living for the elderly and disabled, many homes will have to take account of assistive technology for specific needs and also smart home technology. Smart technology provided by ICTs can help some older and disabled people to lead independent lives in their own homes. It can also relieve some of the burdens of care experienced by family members and carers.

A typical smart home application exploits developments in microelectronics and telecommunications to support daily living. An advanced smart home would have many of the functions typically carried out currently by the occupants happening automatically. This can include basic facilities like smoke alarms and sprinklers, regulation of central heating by thermostats, and safety alarm systems. They can also provide new ways for people to control the home environment (e.g. open and shut curtains from a central console). Existing houses can generally be converted to the 'smart' concept with little structural alteration if the changing needs of residents over their lifecycle have been taken into account in planning.

Projects that have looked at smart homes include HOME-AOM which developed an intelligent multimedia/multimodal user interface which enabled natural control of various home appliances by means of a portable device, and a project in Tönsberg in Norway where eight care flats have been designed to support the home lives of persons with dementia. The focus has been on choosing reliable technology that either has a preventive effect upon accidents or allows for quick notification and rescue should accidents happen.

## **2.3 Web Services**

The Web has now become the main mechanism for the transport of information both for business and leisure activities and millions of people use the Web daily. The Web provides information on every topic; it also provides a vehicle for civic participation, commercial transactions, and education. It gives people access to world news, employment opportunities, and each other. Yet for many people with disabilities, it is currently difficult to access the Web.

The Web Accessibility Initiative (WAI) and the WAI DE program are hosted by the World Wide Web Consortium (W3C), an international vendor-neutral consortium which develops technologies to promote the interoperability and evolution of the Web. The W3C co-ordinates the development of core Web protocols and data formats. W3C provides a setting where WAI can bring together industry, disability organisations, accessibility researchers and government representatives to explore accessibility requirements, and develop accessibility solutions.

The Web Accessibility Initiative (WAI) at the World Wide Web Consortium (W3C) focuses on making the Web accessible to existing and potential Web users who have disabilities. W3C's credibility further assists in ensuring the successful promotion of WAI guidelines, tools, and educational materials to a variety of audiences, including browser and authoring tool manufacturers and site developers.

As the Web is a relatively new development many past projects have not investigated the web as a tool for the elderly and disabled. However, many new IST projects such as IRIS and Telecare are researching this area. WAI-DE and now WAI-DA have provided an opportunity to promote

co-ordination with European organisations focusing on Web accessibility, and to develop materials and activities to support outreach to European organisations. As the Web rapidly displaces existing media, there is an increasing social expectation for its accessibility, and also a growing trend to require accessibility.

## **2.4 Mobile Services**

Mobile phones, personal organisers and satellite trackers, once the play-things of the business community or the preserve of the military, have found a new utility in helping people in their daily lives. With technology's help, basic freedom of movement may ultimately become available to a group of citizens to whom it had previously been denied. Many people with sensory impairments (especially visual impairments), older people with confusion or disorientation problems, and some people with learning disabilities are unable to enjoy the opportunity to move about freely, even in their local areas. Any additional supports that make the environment more accessible will help these people to become more active and mobile members of the community.

Integrated systems offering GSM mobile voice and data along with GPS (Global positioning systems) and GIS (Graphical information systems) are now possible to help the elderly and disabled to become more mobile.

A number of projects have been looking at mobile aids for the elderly and the disabled. MoBIC is an EU project, funded under the TIDE research programme, which aims to increase the independent mobility of visually impaired persons. A user can explore in advance a previously unknown locality and select and prepare a travel route, enabling them to become acquainted with the area until they feel completely safe to actually walk about. Such a service has potentially quite wide utility, for example, in providing support for tourists. Another EU project MORE produced a mobile phone with a GPS localisation feature that enables the potential user to have fast and efficient access to emergency services via service centres equipped with appropriate mapping tools. A special phone user interface will help to integrate disabled and older persons and enhance their autonomy and quality of life. UMPTIDUMPTI, an ACTS project, developed mobile applications and services for a range of disabled users to support social integration.

## **2.5 Assistive Technology**

This is a massive area in itself. Projects tend to focus on one particular user group of assistive technology e.g. aids for the deaf or for the blind and therefore can be very narrowly focused. Assistive technology developments can be split into 3 areas [Price Partnership and iRV, October 2000].

### *1 User-technology interaction*

Speech products including speech synthesis systems, speech recognition systems and speech dialogue systems. Smart cards for access to self-service terminals such as bank cash dispensers and ticket selling machines. Virtual reality systems are currently only used in entertainment but there are likely to be other developments. Internet services. Adapted Interfaces which include operating sticks for head, chin and mouth switch operated by breath, eye gaze systems, adapted keyboards for finger and mouth control, predictive text keyboards, picture keyboards etc. Braille writers translating software and hardware, printers etc. Electronic note takers.

## *2 Interpersonal communication*

Text telephony with integrated fax and Internet facilities. Relay services with and without operator intervention. Videotelephony. Mobile telephony with SMS, fax and email possibilities. Hearing aids and amplification systems. Integrated PC communication systems

## *3 Supporting users in everyday life*

Alerting systems e.g. personal alarms, impersonal alarms and disaster alarms. Language based products which help with learning and training. Wheelchair Interface Devices e.g. environmental control devices, communication aids and robotic manipulators. Home environmental control systems and home bus-systems. Rehabilitation robotics e.g. manipulators and robots

A large number of projects have been working in this area and include EU projects TASC which produced software which incorporated pictures and symbols to support people with cognitive disabilities in their daily lives; VISIOBOARD which produced a gaze control system; VISTEL which investigated systems to allow visually impaired users to access screen based telephony services. There are also many current IST projects working in this area.

## **3 What are the likely future services in 2010?**

The PRISMA project has reviewed current service provision for the elderly and disabled and has looked at the current trends that are taking place. Currently services are very piecemeal addressing specific aspects of the needs of the elderly and disabled. In the future e.g. in 10 years time, these services are likely to be larger more integrated systems.

Some of the trends can be summarised as follows:

There is a trend towards tele-supported home care and smart homes for people with special needs in order to provide independent living. Telecommunications will be essential in order for those with restricted mobility to keep in touch with essential support services. Health monitoring systems are being developed to aid in preventative health care. These small devices will measure elderly and disabled persons vital signs daily and send this information to care specialists over the Internet or via the mobile. Mobile devices used by carers will be able to provide up to date information to aid in the care of the disabled or elderly person.

The control device for smart home devices may be via a digital TV in the future rather than a PC. This may lead to more acceptance by the elderly and disabled who can be resistant to computers. The Internet is likely to be linked to many new smart home developments e.g. remote control of home devices that for example check on house temperature. Systems will help individuals to remember to take medication or to do certain tasks. There will be remote monitoring of activity within the home in case a person living alone has had some problems, and the transmission of personal alarm information over the Internet to a centralised service. Every device in the home is likely in the future to use Bluetooth or wireless LAN technology to transmit data, which is likely to be low cost and very efficient.

All public web sites in Member States will comply with the Web Accessibility Initiative (WAI) guidelines for public web sites. Access to the Internet will be possible through different devices in addition to the traditional PC, such as digital televisions, mobile phones, personal digital assistants (pda's), information booths etc. These will all need to be made available for people with special needs. For example there will need to be specialised interfaces for people with limited functionality; audio and/or virtual reality navigation around web pages; speech control of browsers; smart adjustable screens for people with sight impairment; intelligent agents to help people with cognitive impairments to browse the web; compatibility of Braille writers, scanners

etc; text telephony over the Internet, with automatic speech to text translation; videotelephony over the Internet with automatic speech to signing and text to audio translation of e-mail and web pages for blind people. Systems that facilitate social communication by the elderly or disabled people at home through the Internet will be realised.

Many users are using mobile terminals, which could provide many advantages for people with special needs. Mobile communications are spreading in quantity and diversity. The pace of change is so rapid that there needs to be legislation in place in order to protect the interests of the elderly and disabled. The main problem with current mobile devices is that they have been getting smaller and smaller, to fit into pockets and handbags etc but consequently the displays and controls have also been getting smaller. This may not be suitable for all, in particular the elderly and the disabled, so it may be that devices will need to be designed to accept additional interfaces for specific disabilities. A standardised connection point would aid with these developments. Mobile devices integrated with health monitoring systems will also enhance the independent living of people with special needs. Key information about an individual e.g. name, address, age, contact person, medical problems etc could also be stored on a mobile devices to be used in accident and emergency situations. Integration of mobile devices with wheelchairs and environmental control systems is likely. It is foreseen that all European citizens will carry some kind of personal device. Assistive technology can be integrated into this device to allow tracking to take place, however, care needs to be taken regarding privacy of the individual wearing the device.

There is a trend towards intelligent assistive systems for social inclusion allowing self adaptability of devices, easy customisation of devices, multimedia representations and multimodal access. People with special needs have through the developments in technology now the opportunity to have input and output of information from ICTs in a manner appropriate to their needs. For example, a deaf person can communicate with another deaf person, or a person in a relay centre by using sign language, and therefore prefers, as a result, a video channel to an auditory channel. In addition the concurrent provision of text may also be required. By selecting the appropriate interaction metaphor, alternative ways of human-computer dialogue, compatible with the user's communication channels can be provided, making best use of the developing multimodality of human-computer interface systems and the availability of alternative input/output devices and multi-channel delivery capabilities.

Assistive technology devices are likely to be integrated into PC's, smart TVs and mobile devices. Standardisation across devices will be critical in order to allow users a choice of devices. In addition, devices need to be able to accept different user interfaces, e.g. a device should be usable either by voice command, keyboard, one touch key (scanning) etc. Depending on the type and severity of the disability as well as personal preference, one might choose to use any of these methods to interact with the device. Technological changes mean that developments in multimodal presentation and virtual reality will allow for new assistive technology products such as gaze control systems for interaction, or virtual humans generating European deaf sign languages.

Access to telecommunications can help to organise social relationships at home or at work. Thus, people with disabilities and the elderly can be empowered to actively participate in all facets of life and take their full responsibility (rights and obligations) as members of society. In this context, the main questions are how to ensure that we make full use of telecommunications to increase quality of life for the elderly and people with disabilities and how to alleviate the strains on society as a whole that may result from the demographic shift.

## **4 What are the likely barriers to achieving this?**

The main barrier to realising these services which would be of benefit to the elderly and disabled is obviously cost. Who pays for the infrastructure to provide the services including its devices and then who pays for the services?

In order to provide the services mentioned above there needs to be widescale deployment of broadband services to both industry and the home. This is due to the fact that many of the services e.g. providing multichannel delivery of services requires high bandwidth. Currently this is not widely available due to local access restrictions and cost.

The demand for ICT services from the home for people with special needs may be stronger than that for the general population, due to restrictive mobility of the elderly and the disabled. The elderly and the disabled are a group in society who would greatly benefit from broadband telecommunications provision and assistive technology. However, they are likely to be the sector of the population who are least likely to have the income to invest in such infrastructure. Therefore it is crucial that these issues are addressed at a policy level to ensure that the elderly and people with special needs are not disadvantaged further than they are already. It is more costly for a disabled person to have access to for example the Internet as they may need to purchase additional equipment or have their equipment specially adapted. In addition, the length of a call involving a signing or text relay service greatly increases the length of the call and hence the call charges.

A smart home is one which includes technology to allow for devices and systems to be controlled automatically or remotely by the disabled person themselves. A smart house can help people with physical, mental and sensory disabilities to live independently, however, at a cost. The cost of installation has to be traded against the cost of providing alternative care and support.

Technology is driven by needs, but it is fuelled by a variety of factors, including environment, finance, politics, human knowledge and skills. Technology that is effective and appropriate in one setting may not be feasible somewhere else. Telecommunications have considerable potential to provide for new applications and services for all citizens including people with disabilities and the elderly. User friendly, adaptable and smart applications can be provided at affordable prices.

There is indication that to some extent a reduction of existing inequalities is possible if ICT-supply becomes cheaper and, as a result, access to cheaper information and telecommunication becomes more widespread. But data on ICT-use show high correlations between higher income and social ranking with the possession of computers and other ICT-appliances. In addition, social heritage and education are core factors, thus, contributing to the fear that new technology will create a new digital divide between the ICT-literate and non-literate. [Aichholzer G 2001] This is why adoption by all member states of the eEurope initiative is essential.

Legislation to ensure that all people, including disabled persons, should be able take part in society and have access to the results of technological progress has been adopted in some countries. The USA has the strongest legislation about accessibility and non-discrimination with similar legislation currently being discussed in Europe. It is therefore very important to address these issues where possible.

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