

> Foreword

Improving the quality of life of Europe's increasingly elderly population is one of the most pressing challenges facing our society today. Nearly 14% of the EU population is over the age of 65 and this figure is expected to double by 2050. By then we will have 80 million older Europeans who should continue to play an active role in our society, despite limitations which the ageing process often brings.

Building an inclusive society is a key pillar of the i2010 strategy – a European Information Society for growth and jobs – that will boost the economy with the help of information and communication technologies (ICT). Among many other measures, i2010 targets a European eInclusion initiative for 2008, together with user-driven innovation in ICT-based products and services for the elderly, industry-led provision of accessible technology, and innovative EU research.

Substantial advances have been made over recent years in applying technology to meet the needs of older people. But still much work remains to be done. The i2010 European initiative on Ambient Assisted Living (AAL) – being proposed as a joint initiative between the Commission and certain Member States – promises to play a major role in overcoming barriers to innovation and accelerating developments in this emerging global market.

Member States' support for the inclusion agenda was also evident at the high-level meeting in Riga, Latvia in June 2006, where ministers from 34 European countries gave their backing to an inclusive and barrier-free information society. To address the needs of older workers and elderly people, ministers agreed to work together to: stimulate the market for ICT services and products for the elderly; develop innovative ICT solutions to help older people stay in work longer and improve their work-life balance; and use ICT to enhance older people's active participation in the economy and society. By implementing their Riga undertakings, European countries will take a big step towards making eInclusion a reality.

This brochure provides an insight into the contributions that ICT research and deployment programmes are already making to our policy objectives in this field. Such actions are an essential part of Europe's drive towards an inclusive, knowledge-based economy and society.



Viviane Reding

European Commissioner for Information Society and Media



> Independence and Ageing

Improving the quality of life for Europe's increasingly elderly population is one of the most pressing challenges facing our society today.

Whether young or old, quality of life depends heavily on the efficiency, comfort and cosiness of the place an individual calls "home". For the elderly especially, home is a place of memories where they spend a lot of their time. Their demands on their home environment will increase and change with growing age, especially when their state of health starts to worsen. Yet the ability to perform the activities of daily life with no or little help from others – independent living – is essential to older people's well-being and self-esteem.

A high quality of life is not only about living longer independently. Being able to continue in high-quality employment and contribute productively to the economy – active ageing in work – is also important for self-esteem. And active participation in society, through social contacts and activities, daily economic activities such as shopping, and democratic decision-making are key to well-being.

The focus of this brochure is on **Independent Living for the Ageing Society**, though we will also say a bit about the two other aspects of life and work when growing older.

European Society is Growing Older

Over the last century average life expectancy in Europe has increased for males from 45.7 to 75.0 years, and for females from 49.6 to 79.9 years. At the same time, Europe's birth rate has reduced. Together these two factors mean the EU population is ageing and, looking at long-term projections, this process is set to accelerate in the future.

These demographic changes have enormous economic and social implications. While the number of older people is growing, the share of those of working age is decreasing, putting increasing strain on labour markets, pension systems and social care. Healthcare and social care systems have to cope with an increasing proportion of the population affected by disabilities or chronic illnesses. But demographic change also offers new opportunities. Patterns of needs and demands will increasingly be determined by the elderly, opening up major new markets for ICT-based products and services.



New Solutions for the Ageing Challenge

Building an inclusive society is a key pillar of i2010, the European initiative to boost Europe's digital economy and jobs (see box opposite).

i2010 recognises that technological and socio-economic innovation present opportunities to find new responses to the ageing challenge. Innovative solutions can be envisaged which will enhance the quality of life of older people, mitigate the economic problems of an ageing population, and create economic and business opportunities in Europe. Information and communication technologies (ICT) offer opportunities for new user-oriented services that will allow the elderly to live more independent lives.

ICT-based products and services will allow older people to live longer at the place they like most, while ensuring their autonomy and a high quality of life. They will be assisted to carry out daily activities and, if necessary, be able to have their health and activity monitored, thus reducing the need for institutional care. ICT will enhance older people's safety and security and provide them with access to social, medical and emergency services. And ICT will allow the elderly to maintain social contacts and remain active members of society and the workforce.

Inclusion: An i2010 Pillar for Future Growth

Making use of ICT to enhance quality of life and “electronic accessibility”, chiefly through market-oriented policies, is one of the main objectives of the i2010 initiative which seeks to establish a European Information Society for growth and employment.

An Information Society that is inclusive provides high quality public services and promotes quality of life. It will also stimulate the development of a whole new market for products and services which are more easily accessible for all. Thus, improved “eAccessibility” will have value to a wider audience – not just the elderly – bringing benefits to all technology users and citizens.

The i2010 initiative contains a series of actions to promote inclusion, better public services and improve quality of life:

- ❖ Issue guidance on eAccessibility and coverage of broadband (completed in 2005).
- ❖ Develop an Action Plan on eGovernment and strategic orientations on ICT-enabled public services (issued in 2006).
- ❖ Launch demonstrator projects to test, at an operational scale, technological, legal and organisational solutions to bringing public services on-line in 2007.
- ❖ Set-up three ‘quality of life’ ICT flagship initiatives in 2007.
- ❖ Propose a European Initiative on eInclusion for 2008.

Fostering eAccessibility for All

To push forward on the eInclusion agenda, in September 2005 the Commission adopted a Communication aimed at improving coordination between eAccessibility initiatives in the Member States. The Communication advocates the use of a series of policy approaches not yet widely used in Europe, as well as strengthening and continuing several activities that are already underway.

The Member States are urged to make use of three policy levers available to them by:

- ❖ Using public procurement contracts to improve accessibility requirements in the ICT domain.
- ❖ Exploring the possible benefits of certification schemes for accessible products and services; and
- ❖ Making better use of the “eAccessibility potential” of existing legislation.

The Communication recommends the continuation of on-going activities at EU level in relation to:

- ❖ The development, implementation and use of eAccessibility requirements and standards.
- ❖ Promotion and take-up of the Design-for-All concept.
- ❖ Web accessibility of online public services.
- ❖ Setting targets to benchmark accessibility and monitor progress so as to have European data comparable across Member States.

The Communication emphasizes that research remains a key instrument to investigate new technological solutions to address the needs of the elderly and people with disabilities. It is a fundamental element on the path towards an accessible Information Society for all.

Enabling the elderly to live longer independently at home also makes sense for society as a whole. Home-based care is much more cost-effective than care in a hospital or care home. As demand for these services increases effective use of ICT technologies and services offers an attractive alternative to the cost and disruption of early and unnecessary institutionalised care. In short, the right application of technology could revolutionise the way older people live their lives while bringing benefits for the European economy and society as well.



> Ageing in European Society: A Snapshot

Our Ageing Population

Europe's population is ageing rapidly. By 2020 the proportion of older people in Europe will have almost doubled compared to 1960 (Figure 1). For the EU-25, 22% of the population will be aged over 65 by 2025, rising to almost 30% by 2050. In absolute terms, this represents an increase of 60 million people between 2004 and 2050, to a total of 134.5 million. Furthermore, the proportion of very old people (aged 80 and above) in the EU-25 will grow even more rapidly, from 4% in 2004 to reach 6% by 2025 and 10% by 2050.

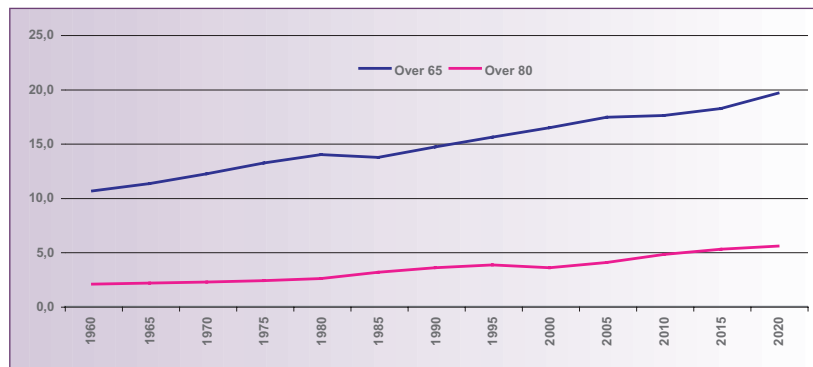


Figure 1: Ageing population, EU 15, 1960-2020
Source: Eurostat

The challenge of ageing societies is not confined to Europe. It is a world-wide phenomenon, affecting most industrialised countries (Figure 2). Thus, the problems – and also the market opportunities – are global.

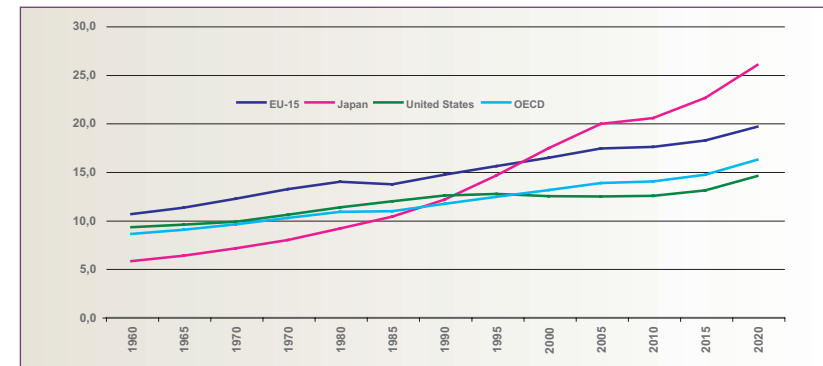


Figure 2: Population aged 65 and over in OECD countries
Source: OECD, 2005

Our household situations change as we get older. In 2010, around one-third (32%) of the EU's elderly population will be living alone (Figure 3). But while 63% of those aged 65-79 will live with a partner, only 31% of those aged over 80 will do so. Hence, demand for housing and social care will increase considerably with expansion of this older age group.

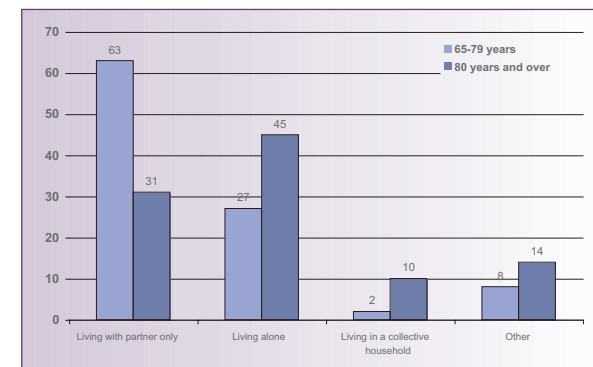


Figure 3: Household situation of the elderly, EU-15, 2010
Source: Eurostat

Impairment, Disability and Health Needs among Older People

The prevalence of disability increases with age at a significant rate. The proportion of those 'moderately hampered' is higher than those 'severely hampered' (Figure 4). But the share of the severely hampered increases with age.

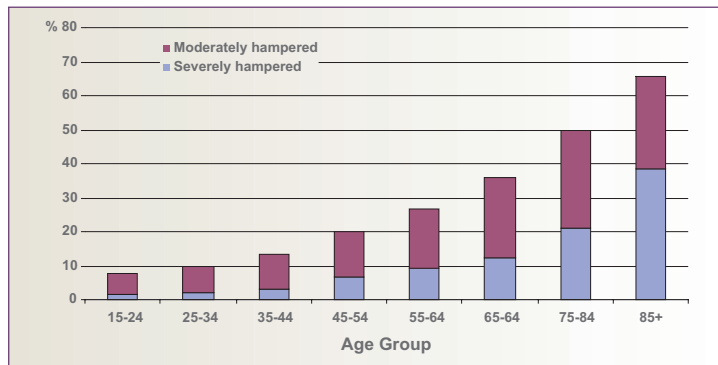


Figure 4: Percentage of people hampered in daily activities by any physical or mental health problem, illness or disability
Source: Eurostat 2004

As a result of the shifting age profile, the size of the impaired population will increase significantly in future years. By 2030 there will be an estimated 75 million impaired people in the EU-15 alone. Thus, although the majority of elderly people will be able to live an independent and relatively healthy life, the risk of becoming impaired remains high.

Older people today generally enjoy better health than ever before. Nevertheless, a majority of the EU population aged 50 and older receives medication for at least one long-term condition (Figure 5). High blood pressure and joint, bone and muscle diseases are the most prevalent. With better living conditions and healthcare, degenerative diseases, especially cardiovascular diseases and neoplasms, have now overtaken infectious diseases as the main causes of death in Europe.

Currently treated for	Percentage of Age Group				Total
	50 - 59	60 - 69	70 - 79	80+	
High blood pressure	23.1	34.8	44.9	41.7	33.7
Joint/bone/muscle diseases	18.9	27.0	30.3	35.2	25.6
Heart disease	7.4	14.5	27.4	35.7	16.8
Diabetes	6.8	9.4	12.2	10.1	9.2
Chronic respiratory disease	5.4	8.8	11.5	11.4	8.5
Any of these (at least one answer yes)	41.7	58.5	68.6	69.9	56.0
Other long term condition (n.o.s.)	16.7	18.5	20.9	22.2	18.7
Any of these (incl. other long term condition)	49.0	64.2	73.5	74.0	61.9

Figure 5: Prevalence of frequent diseases by age
Source: Seniorwatch, 2001

Older People and Technology

Although there are many 'silver surfers', older people generally lag behind the rest of the population in their use of new technologies, as evidenced, for instance, by the use of broadband (Figure 6).

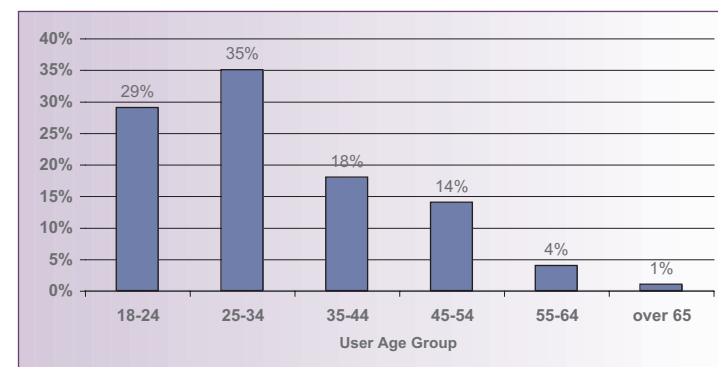


Figure 6: Age of Western European Broadband users, 2004
Source: EITO 2005

> Understanding the Needs of Older People

The success of new solutions in ICT for ageing will depend critically on use and acceptance by the target market: older people themselves. Research shows not everyone would automatically accept and use ICT-based products and services in their everyday life. Usability and acceptability depend on various factors: adequate design, financial resources, living circumstances, personal attitudes and experiences, and of course, the advantages and practicality of the device.

Designers and developers of technologies, products and services must rise to the challenge to give these target groups a real possibility to maintain an autonomous lifestyle and meet their personal needs.

Finding solutions to these challenges will be complex.

A good starting point could be to identify user needs common to all older persons which could then be added to with more specific ones related to health and well-being. These common user needs would include aspects such as:

- ❖ *Safety*: For example, making sure entrance doors and windows are locked/closed when leaving the house or sleeping; checking for water or gas leaks; and turning all but one light off when going to bed.
- ❖ *Reminder function*: Older people's short-term memory is not as good as younger people's, and therefore they may need support in taking medication and fulfilling household tasks.
- ❖ *Infotainment*: Easy to understand – and easy to operate – access to information and entertainment tailored to their specific needs and interests.
- ❖ *User-friendly interfaces*: For all sorts of systems within the home and outside, taking into account that many elderly people have impairments in vision, hearing, mobility or dexterity.



As well as this 'platform' of general user needs, there will be more specific ones related to health and well-being. These will depend very much on the nature of the disease concerned. People with diseases like dementia, Alzheimer's, diabetes, glaucoma, high blood pressure, heart disease, stroke, etc. will have different user needs according to their health problem compared to the elderly in a wheelchair, or those close to being blind or deaf.

To achieve acceptance, researchers could address these general user needs first. Once the elderly recognise the advantages the technology can offer, they will then ask for additional technology-based applications and services addressing their specific health problems. Thus, a step-by-step approach is best. Rather than aiming for perfectly equipped 'smart homes', we should grow from the bottom-up, starting with low-profile devices and systems. Such an approach would also be more financially viable and credible.

Technology for People: The Research Challenge

Experience to date shows some clear messages for researchers, industry and policy-makers on how to develop solutions which will achieve broad acceptance within the older community.

Put users centre-stage

Research should be driven by user needs not by technology.

This means, for instance, that different applications and services should be able to work together – 'interoperate'. Also, solutions should be able to adapt to the needs of individual groups and to their changing needs over time. Ethical implications of proposed solutions will also need to be considered (for instance in aspects such as privacy, confidentiality and security of data). Technology is often only one part of the solution. Asking what specific technologies could do for elderly people is usually not a valid starting point.

Towards integrated social and health care

Independent living is about both social and health care. Many older people experience some form of physical or cognitive impairment, or suffer from a chronic condition. Thus, besides social care there is a clear need for long-term healthcare too. The challenge is to find the right mix of health, social and informal care to match the individual's needs: this requires 'joined-up' thinking by researchers, policy-makers and care agencies on the ground.

Respect individuals' wishes

Old people are not a homogeneous group. Like the rest of the population, there are huge differences in health, income, education and expectations within the older community. National, ethnic and gender differences also come into play. Throughout Europe, however, older people, their families and their carers want to find ways of avoiding institutional care wherever possible. We must find solutions that take account of this diversity and respect the wishes of individual older citizens.

Don't forget the carers

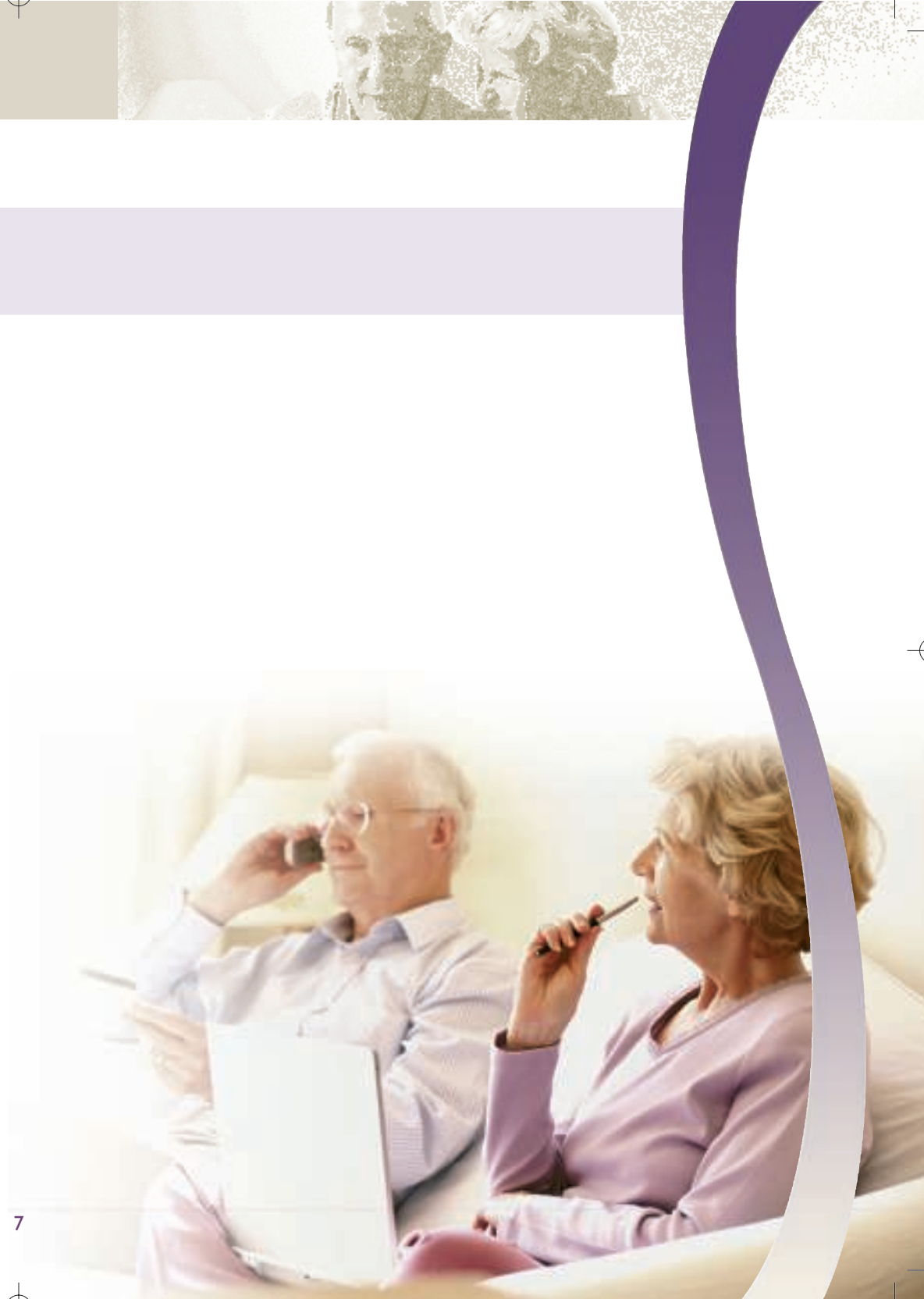
Carers - both professional carers and families - play an important part in the lives of many elderly people. This is especially the case for dementia, where the number of sufferers is growing rapidly. Technological solutions must support these carers and families, as well as the sufferers themselves.

Needs change

Elderly people's needs and expectations evolve with time. Following an operation or period of illness, for example, elderly persons may require increased levels of care whilst they recuperate. They may then be able to resume their former lifestyle with less support from carers. Similarly, the 'older old' (those aged 80+) tend to have different needs from those in their 60s and 70s.

Working together for innovative solutions

The problems call for a multidisciplinary approach. Informatics and engineering experts need to work closely with sociologists, psychologists and behavioural scientists to understand how to design care systems that integrate easily into the lifestyles and behaviour patterns of the end-users.



> Innovation for Health, Well-being and Independent Living

We are still only in the early stages of exploring how to apply technology to the challenges of ageing and independent living.

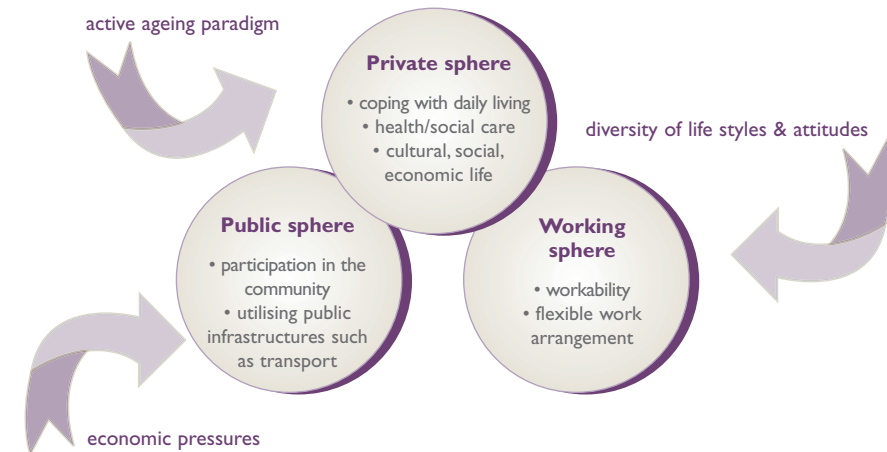
Today, technology often raises expectations that it then fails to deliver. Mobile phones, for example, are now so small and have many complicated features that many older people find them difficult to use. However, marketing a product as 'suitable for older users' is generally counter-productive. Most elderly people do not like to be seen using 'products for the old'.

The 'Design-for-All' concept is an important way of ensuring that products are suitable for use by older people. It shows that good design principles bring benefits for all users of ICT systems, but recognises that with serious levels of physical or mental impairment specially adapted devices will be needed.

A Model for ICT Innovation for Ageing

Clearly, we need a new model of innovation in ICT for Ageing, one which is needs-oriented and puts users at the centre of ICT systems. New solutions are needed across all aspects of older people's lives, whether in the private sphere, the public sphere or at work (see diagram).

It is no longer a question of helping the old and frail to cope with daily life. Rather it is about enhancing quality of life by enabling older people to take part in a full range of social, economic and cultural activities. This will involve seamless integration of assistive applications with mainstream (e.g. consumer electronics) products and technology-supported care services.



Such an approach needs to consider basic (or enabling technology) research, applied R&D, and deployment activities.

Key technology fields include:

- ❖ Materials - polymer technologies, nanocoatings
- ❖ Micro and nanotechnologies, including sensors and biochips
- ❖ Embedded systems - as in smart textiles and home automation
- ❖ Human-machine interfaces - display technologies, natural language communication, gesture recognition
- ❖ Communication - body area and home networks
- ❖ Software, web & network technologies - e.g. teleservices

As the problems are essentially application-oriented, we can build on integration of existing and emerging technologies on the basis of open architectures and platforms. Research efforts should focus primarily on integration and on offering flexible and modular solutions that can be easily adapted to meet the specific requirements of the target group and/or the given infrastructure. **User requirements should be paramount throughout, as well as localisation to match differing social patterns across Europe.**

Products and Solutions for Health, Well-being and Independent Living

Application areas for possible products and solutions to support independent living for the elderly are wide ranging and include: safety-related services, healthcare and medical devices, 'wellness services', mobility and social care services, smart homes, smart textiles, robotics and consumer electronics.

For instance, we can conceive of a variety of applications to make older people's daily lives easier, more comfortable or secure, including:

- ❖ Using digital TV to access and use public information and services.
- ❖ Using self cleaning devices, independently acting vacuum cleaners or nano-particle-laminated windows to help manage the household.
- ❖ Simplifying contact with relatives and physicians, using improved audio or video communication systems.
- ❖ Flexible keypads based on smart textiles to make ICT devices easier to use (first examples are already on the market).
- ❖ Individual interior designs with light, music or information access systems to improve well-being and peace of mind.



There are also many health-related examples, such as:

- ❖ Mirrors that automatically display important health data when people look into them each morning.
 - ❖ Telemetric monitoring systems in or on the body that collect physiological data (e.g. ECG and blood pressure) and transmit it directly to the physicians.
 - ❖ Carpets, cloth or body sensors that trigger emergency functions for critical situations like heart attack, unconsciousness or falls.
 - ❖ Sensors and actuators in the mattress that prevent bedsores for bedridden patients.
 - ❖ Optical or biochemical sensors integrated into bandages to monitor the healing of acute and chronic wounds.
 - ❖ Monitoring of food, weight and movement for home-rehabilitation. For example, enabling patients to exercise at home with continuous assessment by a physician.
- Innovation here draws not only on technological devices and high-tech products but also on services. Many organisational and institutional innovations will be required. For instance:
- ❖ Innovative services (e.g. ambulant services, care at home).
 - ❖ Development of innovative housing and living concepts (for instance, new house types, seniors flat sharing).
 - ❖ Specialised institutions and organisations, offering these services.
- ❖ A closer co-ordination between care providers (improved link between primary care, secondary care and social services).
 - ❖ Institutional and regulatory reforms (new financing models, integrating public and private sources, etc.).

Thus, innovations for ageing will embrace various aspects beyond pure technology.

> Living Independently

One of the key factors in helping older people to live independently is to manage the inevitable physical and cognitive impairments often associated with growing old.

Many older people are able to function perfectly well around their own homes, but are looking for reassurance that they will be able to call for help easily if things go wrong. Or they may be reluctant to move around their home because limited mobility or dexterity prevents them stretching or picking things up.

Results from European projects demonstrate a number of examples of how ICT can help older people to remain autonomous within their daily lives.

User-friendly Mobility Aids

Mobility is a key feature in maintaining personal independence and increasing numbers of people experience some form of mobility impairment. Many people shy away from using conventional mobility aids (crutches, walkers, wheelchairs) due to their stigmatising effects, even if walking causes increasing stress, fatigue and pain, and despite the risk of falling. The last decade has seen the evolution of more and more complex mobility aids, such as wheelchairs with in-built navigation, manipulation and transport capabilities. Commercial success of these systems has been limited, however, since they are bulky, expensive and difficult to operate.

Recognising the drawbacks, **MOVEMENT** is developing a new solution which meets the users' expectations for inconspicuous, flexible and affordable personal mobility aids. The project focuses on all three aspects of mobility (moving people, objects and information) through a fully modular set of assistive devices that can be freely assembled depending on the user's needs.



Based around a generic and mobile robotic platform, the system is able to manipulate everyday objects and, using advanced sensors, to navigate within a known indoor environment. Users control the system through an intuitive interface readily usable by the elderly and people with disabilities. MOVEMENT's researchers foresee the system being integrated into intelligent housing environments.

Location Independent Mobile Alarm Service

Social alarm services allow elderly people to stay in their own homes while having the security of knowing that help is on-call should they need it. Across Europe, around 6% of all households with people aged over 50 are connected to social alarm services, and these numbers are set to increase significantly in future. One shortcoming of these existing services, however, is that they are fixed to one location.

MobilAlarm, an eTEN project, tested an innovative, location-independent alarm service which will allow users to initiate an alarm call whenever and wherever they need to. Partners representing the whole value chain were involved from device manufacturers to service centres and patient associations. The tests revealed that the device and service are suitable for market introduction and that there is a large potential market for such an easy-to-handle emergency unit.

By pushing a single button a speech link is established connecting the user directly to a professional response centre. This is possible from almost any location (within reach of mobile network services) and at any time. The speech link also transmits the location coordinates. In case of an emergency, the response centre will organise help as appropriate: relatives, neighbours, mobile response staff, doctors or professional emergency services. Help can be directed to any location required and as fast as possible.

Controlling Our Environment through Mobile Phones

MIMOSA deals with context-aware mobile services and applications. The approach is mobile phone based, thus providing the users with a smooth transition from current mobile services to the new generation of ambient intelligent services. It will be suitable for a wide range of applications where low-cost, low-bit rate, short-range connectivity is required.

The vision is to put sensors into as many objects as possible, and to network them so as to enable wireless communication and interactions with the outside world. All this will happen in the background, invisible to the elderly person. For instance, a mobile phone containing an RFID ('smart tag') reader could be pointed at other smart objects to trigger an action or read out additional information.

This user-centred approach offers high comfort and care without bothering the elderly user unnecessarily, and at the same time offering a maximum of care, safety and security.

Intelligent Medical Implants

A key limitation to living independently is the onset of medical conditions which require constant medical care. One way of remedying this is through intelligent medical implants.

HealthyAims is developing a range of medical implants to help the ageing population and those with disabilities. The devices have communication capability and exploit the full range of advanced technologies in design, materials, processes and manufacturing. In particular, the work integrates and extends existing knowledge in microsystems, biomaterials, wireless communications, power sources and body area networks (BANs).

The medical products being developed include: cochlear implants; retina implant and glaucoma sensor; functional electrical stimulation for upper limbs (FES); sphincter sensor for oesophageal and urological applications; and implantable pressure sensor to monitor intracranial pressure.

The project is working closely with various end-users: clinicians/doctors, carers and clinical manufacturers. Their involvement is important in stimulating demand and creating a route for early adoption of the innovative products being developed.



> Keeping Healthy

Prevention is Better than Cure

Good health is key to a good quality of life. One only has to look at the number of magazine features on health and well-being, the best-selling books on health and lifestyle, and the wealth of health information on the internet, to appreciate that people have a genuine interest in looking after their health. Still, three out of four Europeans die as a result of either cardiovascular diseases or cancer. Many of these deaths could be prevented if people paid greater attention to lifestyle-related factors such as smoking, nutrition, physical exercise, social relationships and their environment.

The advantages and benefits of preventive healthcare are widely recognised, but despite this, current health systems in OECD countries invest only a fraction of their expenditure (merely 3% on average) in prevention of diseases.

ICT can play an important role here: firstly by enabling wider availability and application of preventive healthcare; and secondly by encouraging citizens to adopt appropriate lifestyle changes. A new generation of innovative, secure, portable and wearable health systems will be able to provide people with personalised information and guidance at home, work, or outdoors, thus supporting them in managing their lifestyle and maintaining their health status.

These personal health systems will:

- ❖ Help individuals at risk of developing diseases to manage their risk factors (such as high cholesterol or high blood pressure) and ultimately prevent the appearance of diseases. Thus, they will be empowered to adopt a healthier lifestyle while benefiting from continuous or periodic monitoring of health status, with direct support from healthcare professionals as required.
- ❖ Provide those who have chronic conditions with the means to manage their conditions in the comfort of their own home, knowing that they are able to interact directly with care providers when needed. This will allow people to remain active, both in a social and working context, despite suffering from chronic conditions.

Research for Active Health

ICT research in FP5 was first to place emphasis on supporting the delivery of health-care at the point of need. The concept of Personal Health Systems was introduced as an important topic in order to help disease prevention, health promotion and delivery of home care. This effort has continued in FP6, with more emphasis on integrated systems and services and on the personalisation of health systems and care.

AMON has developed a wrist-worn medical monitor and alert system for individuals at high risk of developing cardiac or respiratory diseases. The unobtrusive, wrist-worn device collects and evaluates a person's vital signs, and detects medical emergencies. It can be linked to medical centres via cellular networks, to allow continuous, long-term monitoring in ordinary living and working environments. Thus, the AMON device enables individuals to monitor their health status while going about their everyday activities.

WEALTHY has developed intelligent garments that constitute a non-invasive and wearable monitoring system. The garments employ embedded fabric sensors to measure vital physiological signals, like ECG. Data related to a person's physiological status is transmitted wirelessly via cellular networks to health professionals. In this way, the sensing garment can be used "anywhere" - at home, at work and even outdoors. Based on the recorded information, the system is able to provide patient feedback and generate medical alerts.

HEALTHY MARKET and **H-LIFE** are more examples of research activities funded under FP5. The coordination action **ACTIVE HEALTH** provided a common platform for these projects to exchange knowledge with each other and with the medical community. It also addressed issues such as interoperability of the products developed.

Under FP6, related activities are being continued under the Integrated Projects **MyHeart** and **PIPS** (see boxes opposite). Another project, **OFSETH**, aims to extend the capabilities of wearable solutions for personal health monitoring, through the integration of the optical fibres technology into functional textiles.

Clothes that take your pulse

Aiming to take lifestyle monitoring one stage further, **MyHeart**, an FP6 Integrated Project, is integrating advanced medical sensors into textiles to create 'intelligent biomedical clothes'.

Focusing on the prevention and monitoring of cardiovascular diseases, MyHeart is developing smart systems and supporting services that empower the users to take control of their own health status. The system uses continuous or periodic monitoring of vital signs to make diagnoses, detect trends and react to the results. All of the information processing is done while the device is on the body and can then be communicated either to the user or to the professional medical services.

Having investigated and evaluated an initial set of 16 application ideas, the project is now focusing on four application concepts. These address healthy people or people at risk (fitness and prevention oriented concepts), patients after an event (rehabilitation) and chronically ill patients (disease management).

www.hitech-projects.com/euprojects/myheart/



Making lifestyle choices easier

PIPS, an FP6 Integrated Project, has set out to create a support environment to help users in their day-to-day decisions on health and lifestyle. This will improve healthcare delivery models, while creating possibilities for healthcare professionals to access relevant, updated medical knowledge and for European citizens to choose a healthier lifestyle.

Using the latest ICT devices (mobile phones, PDAs, etc), PIPS helps the individual by providing all the necessary information at the point of decision (home, supermarket, restaurant, gym), thus allowing them to follow their GP's therapeutic and nutritional instructions. In addition, PIPS allows healthcare professionals to access all the medical information necessary to define a "healthy plan" tailored to the patient, including therapeutic treatment (if needed), nutrition guidelines and physical activity planning.

www.pips.eu.org



> Remaining Active

As Europe's population ages it is essential that elderly people remain active members of society. ICT can contribute to 'active ageing', helping the elderly to maintain their mobility and to stay involved in their communities and the worlds of work and employment.

The following examples highlight areas where European projects are working to support older people's mobility and their social and community involvement.

Accessibility Planning at Your Fingertips

Many elderly users, especially those with disabilities, are prevented from going out shopping, visiting public parks, theatres, etc. because they are unsure about the accessibility of their trip. Currently, the simplest of excursions can involve military-scale planning to ensure that the proposed journey is feasible. Will the next bus be wheelchair friendly? Is there anyone available in the supermarket to help with the shopping?

MAPPED, an FP6 project, is developing an intelligent system that will empower the impaired elderly to increase their autonomy and to play a full role in society. The idea of MAPPED is to allow the user to plan and re-plan excursions while they are on the move. Therefore the user interface has to be mobile.

The system is based around a web browser running on PDAs or smart phones, initially incorporating audio output to facilitate the visually-impaired, and voice command recognition for ease of use. To extend the range of users, later in the project other assistive technologies will be added that can control the interface (e.g. Headmouse). Localisation features are also included. For instance, if the user indicates that they are at the door of a certain establishment (pub, coffee shop, etc.), MAPPED will provide all the accessibility information they need to go inside.



Mobile Personal Assistant for Travel Information

Also concerned with mobility, **ASK-IT** is developing working personalised route guidance services for the elderly and others with impaired mobility. These services will provide relevant and real-time information, primarily for travelling, but also for use at home and at work. The services are being demonstrated in eight major European cities, using a platform developed under a previous research project **IM@GINE IT**.

For example, ASK-IT could assist an elderly traveller to find the right bus stop at an airport and then tell them when to get off to find a hotel or restaurant with accessible facilities. While visiting a town, the user will be able to use their mobile phone to request information about local facilities, including whether or not they are accessible to him/her. The profile stored on the mobile device could include parameters such as the turning radius of their electric wheelchair, for instance, so that restaurants meeting these specific needs are selected.

Active Ageing in Work and Employment

eInclusion@EU supports policies to promote active ageing. The project has been studying innovative ways to reach out to those who are excluded and could benefit from closer contact with computers as tools. It has a particular focus on non-discrimination (eInclusion) and developing strategies to help those who have difficulty physically accessing services (eAccessibility).

Research shows that increased IT skills bring a corresponding increase in employability. They can also make workplaces more flexible, offering opportunities for innovative arrangements that better fit with individual preferences, responsibilities and restrictions that may increase with age. In addition, for the majority of older people, the workplace is where they can gain experience with ICTs and develop skills that can then be used in other areas of their lives.

Based on a series of workshops with stakeholders, the project has come up with recommendations on how to interlink active ageing and eInclusion policies better. Policy-makers and employers should look at issues such as:

- ❖ Investing in e-skills of older workers;
- ❖ Designing ICTs to cater for age-related changes in perception, dexterity and cognition; and
- ❖ Organising ICT-related work to suit the needs of older workers.

They should also consider establishing a harmonised and robust European evidence base on the contribution of ICTs to active ageing in work and employment.

Other recommendations were also put forward for innovative, practicable and verifiable policy strategies and implementation measures with realistic goals.



> Staying Longer at Home

Deteriorating health brings a different set of needs for supporting older people within the home environment. Individuals will generally wish to stay in their homes for as long as possible – which also minimises the social costs - meaning that the home becomes a place of continuing medical care. People who suffer from health conditions will generally have carers – often long-term – who also need to be supported and assisted.

This aspect has been a key focus of European research over recent years, and European projects have made a number of advances in applying ICT to home-based monitoring and health and social care.

Easing the Care Burden in Long-Term Illnesses

Giving long-term care for family members takes a heavy toll on carers. The term “caregiver burden” has been used to describe the physical, emotional, material and social costs carers experience.

One problem associated with many care situations, especially conditions such as hypertension and Alzheimer’s, is the necessity to monitor the patient’s drug taking.

As a solution for this, the **IntelliDrug** project is developing a miniature system that sits inside the mouth and administers the drugs automatically. The dental appliance contains a medication replacement reservoir and releases the medication in a controlled, intelligent manner according to the patient’s needs, in periods lasting days, weeks or months. The device can be reloaded in a simple non-invasive way.

The micro-system comprises a medication release mechanism, built-in intelligence, micro-sensors and micro-actuators, and a remote control. It will help afflicted persons to put an end to their personal misery, and to run a life as close as possible to normal.



Continuous Mobile Services for Healthcare

Being free to make choices about daily activities is one of the aspects that defines a person’s quality of life. But a simple walk in the park is not that simple for everyone. Chronically ill people, or those living with a condition that needs regular monitoring, are often limited and not free to do things spontaneously. Their regime is planned around hospital visits, check ups and overnight stays. In many cases, they feel insecure to be away from medical attention, worried that it is too risky for their health.

HealthService24, an eTEN project, is validating a new platform for continuous mobile health services. It builds on the initial work of the FP5 eHealth project **MobiHealth**. A user is equipped with sensors interconnected under a body area network (BAN) managed by a PDA or a mobile telephone. The collected data is constantly and wirelessly transmitted via the mobile phone network either to a medical service centre or directly to medical professionals.

At the service centre, an individual’s body data can be analysed immediately and personalised feedback made to patients in real-time (e.g. through alarms or reminders). Healthcare professionals can assess, diagnose and treat patients remotely, and in the event of rapidly deteriorating medical conditions the data centre can also send an SMS-alarm or provide the patient with first-level medical support.

Health Information for Home and Community Care

One of the key requirements in home-based care is being able to connect medical facilities to the patient’s home. The eTEN project **MCC (Medical Care Continuity)** is undertaking a market study to prepare the launch of a new service for at-home medical care. This service integrates the follow-up of the patient at-home, by the hospital, through a combination of advanced communication technologies and the daily services of an assistance company.

Health-eLife, another eTEN project, is validating the Doc@Home™ service in the context of typical European hospital environments, specifically outpatient clinics in Finland, Sweden and the UK. Doc@Home™ is an enabling service for healthcare providers seeking to manage chronically ill patients in the home and community. It allows healthcare professionals to access a patient's medical records securely and remotely from the patient's home. The study will provide information on chronic disease management across a range of clinical dimensions.

Bio-sensing Textiles for Managing Chronic Diseases

Integration of health monitoring tools into textiles has been talked about for some time. The European Commission has invested in research efforts in this field throughout FP5 and FP6 (see page 12). To date, developments are mainly focused on physiological measurements (body temperature, electro-cardiogram, electromyogram, breath rhythm, etc.) with first applications targeting sport monitoring and prevention of cardiovascular risk. Biochemical measurements on body fluids will be needed to tackle very important health and safety issues.

The **BIOTEX** project is investigating dedicated biochemical-sensing techniques compatible with integration into textiles. This goal represents a complete breakthrough, which allows for the first time the monitoring of body fluids via sensors distributed on a textile substrate and performing biochemical measurements.

The research work focuses primarily on the sensing part and its electrical or optical connection to a signal processor. Sensing patches are being developed which are adapted to different targeted body fluids and biological species, where the textile itself is the sensor. Researchers plan to extend this to the whole garment and to integrate physiological monitors.

Instrumented clothes will allow remote monitoring of vital signs, diagnostics to improve early illness detection and metabolic disorder and reduce treatment costs. Ambulatory healthcare, isolated people, convalescent people and patients with chronic diseases will all benefit.



> Towards a European Approach

Substantial advances have been made over recent years in applying technology to meet the needs of older people. But still much work remains to be done.

We need to understand much more about the needs and requirements of elderly users and how technology can help them in their daily lives. Then we must press ahead with developing relevant technologies and systems that meet these needs. And European industry must decide how to make the most of the commercial opportunities presented by the new 'silver euro'.

To tackle these issues it is planned to implement during the 7th EU Framework Programme a new European initiative, called **Ambient Assisted Living (AAL)**, (www.aal169.org). This would be a new type of R&D initiative, based on Article 169 of the European Treaty which enables the European Commission to participate in research programmes undertaken jointly by several Member States.

Partnering and co-ordination of resources and activities at European level is the optimal approach to meet the challenges all European societies are facing as a result of demographic change. More than ever before, common efforts are needed to keep pace with soaring social and healthcare costs. But there is also a need for AAL solutions to be localised and adapted, so as to be compatible with varying social preferences and regulatory requirements across Europe.

If approved, the AAL initiative promises to be an important component of the i2010 programme to boost Europe's digital economy. The initiative will:

- ❖ Stimulate the development of products and services for societies being characterised by demographic changes.
- ❖ Be market driven, with a strong SME and user orientation and a focus on economic impact in the short to medium term.

- ❖ Improve policy co-ordination in a field where the innovation process has to be accompanied and stimulated by public authorities because of its social dimension.

The proposed AAL initiative will fund research and innovation projects, with emphasis on integration of required technologies into relevant products and services. In this way it aims to reinforce a consolidated European market for AAL products, environments and services. It could play a major role in overcoming barriers to innovation and accelerating developments in this emerging global market.

The AAL initiative will focus on applied research, complementing the longer term research on ICT for Ageing that will continue to be supported within FP7, notably under the research actions for health, inclusion, embedded systems, and micro-nano-technologies. The ICT Policy Support Programme, part of the Competitiveness and Innovation Framework Programme, will focus on market validation and large scale pilots and demonstrations, completing the continuum from advanced research to deployment.



> Projects List

FP5 = Fifth Framework Programme; FP6 = Sixth Framework Programme; eTEN = eTEN Programme; eContentplus = eContentplus Programme

PROJECT ACRONYM	PROJECT TITLE	PROJECT WEBSITE	PAGE
AMON	Advanced Care and Alert Portable Telemedical Monitor	www.wearable.ethz.ch/amon.0.html	12
ACTIVE HEALTH	Environment for Health Promotion and Disease Prevention	www.hon.ch/project/activehealth.html	12
AAL	Ambient Assisted Living - Preparation of An Art. 169 Initiative	www.aal169.org	18
ASK-IT	Ambient Intelligence System of Agents for Knowledge-Based and Integrated Services for Mobility Impaired Users	www.ask-it.org	14
BIOTEX	Bio-Sensing Textiles to Support Health Management	www.biotex-eu.com	17
eInclusion@EU	Strengthening eInclusion & eAccessibility Across Europe	www.einclusion-eu.org	15
H-LIFE	Intelligent Personal Health Assistant	n/a	12
HEALTHY MARKET	A Virtual Marketplace for the Implementation of Healthy Nutritional Plans	www.healthy-market.org/eu/hm/	12
Health-eLife	Doc@HOME Home Based Management of Chronic Disease Sufferers	www.health-elife.co.uk	17
HealthService24	Continuous Mobile Services for Healthcare	www.healthservice24.com	16
HealthyAims	Nano Scale Materials and Sensors and Microsystems for Medical Implants Improving Health and Quality of Life	www.healthyaims.org	11
IntelliDrug	Intelligent Intra-Oral Medicine Delivery Micro-System to Treat Addiction and Chronic Diseases	www.intellidrug.org	16
MAPPED	Mobilisation and Accessibility Planning for People With Disabilities	www.bmtproject.net/mapped	14
MCC	Medical Care Continuity	www.eten-mcc.org	16
MIMOSA	Microsystems Platform for Mobile Services and Applications	www.mimosa-fp6.com/	11
MobilAlarm	Validating European Mobile Alarm Services for Inclusion and Independent Living	www.mobilalarm-eu.org	10
MOVEMENT	Modular Versatile Mobility Enhancement Technology	www.fortec.tuwien.ac.at/movement	10
MyHeart	MYHEART - Fighting Cardio-Vascular Diseases by Prevention & Early Diagnosis	www.hitech-projects.com/euprojects/myheart/	13
OFSETH	Optical Fibre Sensors Embedded Into Technical Textile for Healthcare Monitoring	www.ofseth.org	12
PIPS	Personalised Information Platform for Life and Health Services	www.pips.eu.org	13
WEALTHY	Wearable Health Care System	www.wealthy-ist.com	12

