

Ambient Assisted Living Policy Recommendations



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**Ambient Assisted Living Policy Recommendations
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1. Rationale for a Ambient Assisted Living R&D policy in Europe

1.1 Demographic trends

In the imminent years and decades, European societies will face serious demographic changes. As in other industrialised countries the population's average age will drastically increase. The "ageing society" is becoming not only an evident challenge for the social security systems but for society as a whole. Recent European population projections for 2008-2060 published by the European Office for Statistics underlined these demographic developments. From 2015 onwards, deaths are projected to outnumber births in the 27 countries of the EU. Almost three times as many people will be aged 80 or more in 2060¹.

The social behaviour and lifestyles as well as the identity of the individual older person will change if current trends continue. Their requirements and consumer behaviour will change both in quantitative and qualitative terms. With higher expectancies of life and rising retirement ages in European countries, the proportion of older people at work will increase as well as the number of elderly people participating actively in social life. But also the number of elderly people living alone and of those who live under the average subsistence level will increase.

Although older people in the future will remain self-sufficient for a longer time, more people will need high intensity care in the end-of-life period and more people will need support in daily life operations prior to this phase due to more or less intense disabilities². Increasing life expectancy is accompanied by an increasing prevalence of health impairments, by mental health problems as well as dementia, as e.g. the Alzheimer disease. The number of people reporting to be hampered in daily life activities will also increase. As for labour markets, pension systems and social schemes in general, we have to consider that demographic ageing means that the number of older people is growing while the share of those of working age is decreasing. Not only will the income side of social schemes be affected but also expenditures: health care systems will be concerned as an ageing population will lead to an increase in the proportion of people with disabilities or chronic illnesses. Thus, health care systems and social care in general – which is typically organised on national level and characterised by national differences as for the institutional design – will have to cope with increasing requirements both in quality and quantity and thus increasing expenses.

As a result demographic and socioeconomic developments and the ageing of the European population will lead to:

- a growing number of older people who live by themselves and who are in need of care, especially intensive care
- a growing number of older people lacking basic financial and social resources and will have difficulties to obtain a minimum of health and care services
- a high number of financially stable and wealthier senior citizens who are able to enjoy their retirement and spend their money on products that secure and enhance not only their wealth, safety, security but also their entertainment and communications needs,

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<http://europa.eu/rapid/pressReleasesAction.do?reference=STAT/08/119&format=HTML&aged=0&language=EN&guiLanguage=en>

² European Commission: Confronting demographic change: a new solidarity between the generations, 2005. http://europa.eu.int/comm/employment_social/news/2005/mar/comm2005-94_en.pdf

- changing family relations and living situation (e.g. larger geographic distances between relatives) impacting the amount of support family members can give
- an ageing workforce in general and the need to keep older active in society and at work.

At the same time these developments are accompanied by changes in how healthcare and care is organised in society in some countries – e.g. the trend towards a more decentralised care models in local care centres and at home and the rising importance of self-managed care.

Facing these challenges and opportunities of ageing societies in Europe, there exist opportunities, where technological and socioeconomic innovation can enhance the quality of life for older and impaired people, mitigate the economic problems of an ageing population, and create new economic and business opportunities in Europe. It is assumed that Ambient Assisted Living (AAL) technologies and services for elderly people can play an important role to solve some of the increasing future problems. The European action plan “Aging well in the Information Society” addresses ICT in context of aging. ICT can help older individuals to improve their quality of life, to lead healthier lives and to live longer, so extending their active and creative participation in the community. In some cases, a wide adoption and massive use of these technologies will be necessary to guarantee at least a minimum service for older citizens in the future.

1.2 Economic Trends

In the information society, Companies try to offer more individualized service offerings, in order to address new customer groups. Oftentimes, one company integrates services of several suppliers, thus reducing the complexity for the end user and creating custom-tailored services. Services for AAL need to be individualized and flexible:

- Hospitals - very important players in the health system – are increasingly trying to differentiate their offerings from competitors. They offer a broader portfolio which is more tailored to individual customer needs. This trend is strong for private hospitals and hospital chains but also starting at publicly owned hospitals.
- Telemedicine companies are evolving as new players that complement existing stationary and ambulant treatment – one could also say a gap is filled. Many European countries are currently restricting telemedicine to a minimum. However, with the striking arguments of significantly lower costs and high quality, it is only a matter of time until telemedicine will be an important part of every country’s health system.
- Services offered by care delivery organization – in the broadest sense: home care organizations, security firms, community centres, etc. - are becoming more important than equipment and result in a b2b business model.
- Integration of services at the site of care delivery organization will become an important differentiator.

1.3 *Technology trends*

Also general technology trends in the next decades will foster and shape future of Ambient Assisted Living applications in the future:

- The internet will be available in every device - the Internet of things will enable internal and external support systems in the home.
- RFID capable devices (including Near Field Communication (NFC), Electronic Product Code (EPC), etc.) will penetrate daily life
- concepts of context Awareness. The Assisted living (AL) system may have in the future aware of presence of user, location, devices and date/time etc. This requires presence detection capabilities.
- The integration of services - devices can be directly connected to even external services
- Networking capacity is increasing, enabling video and multimedia communication between home and external world
- Broadband communication is becoming more and more available at the home, but also on wearable equipment. (There are however large difference between the broadband availability in different countries or regions and in usage adoption between different age groups.)
- The rise of the robotics - i.e. self moving devices in care
- Advance recognition of user states. i.e. susceptibilities, feeling, faces
- Integration of entertainment devices. The trend towards standardization (UPnP, DLNA, etc.) and entertainment devices being capable to communicate with each others.
- Easy authentication systems. Advanced authentication systems may develop in the future more easy to use.
- Communication capabilities in home artifacts - inside devices and - further beyond - embedded in the house.

1.4 *The scope of AAL*

In the AAL Joint Programme the way to Ambient Assisted Living products is defined in the following way:

- Foster the emergence of innovative ICT-based products, services and systems for ageing well at home, in the community, and at work, thus improving the quality of life, autonomy, participation in social life, skills and employability of older people and reducing the costs of health and social care.
- This may be based e.g. on innovative utilisation of ICT, new ways of customer interaction or new types of value chains for independent living services. The results of this process could also be used by other groups of people, namely people with disabilities.

The idea of Ambient Assisted Living has close links to Ambient Intelligence which refers to electronic environments that are sensitive and responsive to the presence of people. Ambient Intelligence is based on ubiquitous computing and intelligent social user interfaces. Such an environment would consist of many invisible distributed devices throughout the

environment or incorporated into appliances or furniture. Such an environment would be tailored towards the user's needs, could recognize him, would adapt to him and his situation and would anticipate his desires as far as possible without conscious mediation with him.

In the document "Ageing well in the Information Society: An i2010 Initiative, Action Plan on Information and Communication Technologies and Ageing" (Brussels, 14.6.2007 COM (2007) 332 final) the following areas of user needs are identified.

- Ageing well at work or 'active ageing at work': staying active and productive for longer, with better quality of work and work-life balance with the help of easy-to-access ICT, innovative practices for adaptable, flexible workplaces, ICT skills and competencies and ICT enhanced learning (resp. e-skills and e-learning).
- Ageing well in the community: staying socially active and creative, through ICT solutions for social networking, as well as access to public and commercial services, thus improving quality of life and reducing social isolation (one of the main problems of older people in rural, scarcely populated areas, as well as urban areas with limited family support).
- Ageing well at home: enjoying a healthier and higher quality of daily life for longer, assisted by technology, while maintaining a high degree of independence, autonomy and dignity.

Based on the observation, that a person (with in- or on-body sensors) traverses multiple physical spaces (room, home, car, working location, shop, out-door, each with a collection of environment sensors, either physically placed in the physical space or built into furniture or appliances) and virtual spaces (e-shopping, gaming, chatting, searching or planning activity) e.g. depending on current activity or focus, it is proposed to adjust the area "Ageing well at home". The current definition is strongly related to a location. In context it might be more practical to replace this area by another one "Ageing well for the person" and adding to the definition "either at home or on the move". This would give us the following three areas: AAL4persons (consisting of AAL@home and AALon_the_move), AAL@community, AAL@work.

To realize these environments which are sensitive and responsive to the presence of people and serve the needs for the three areas mentioned above we need technologies in the domains of: sensing, reasoning, acting, communicating and interaction.

Key technology domains for AAL:

- Sensing: anything and anywhere: in- or on-body, in- or on appliances, or in the environment (home, outdoor, vehicles, public spaces etc.).
- Reasoning: aggregating, processing and analysing data, transform into knowledge within different and often across connected spaces (body, home, vehicle, public spaces). Reasoning engines could be implemented on a dedicated device together with one or more sensors, on an on-body device for mobile situations, on a home device, or on some server somewhere connected to a network.
- Acting: automatic control through actuators, feedback (e.g. information, suggestions, guidance) which can be local or remote (e.g. call center) instantaneous (e.g. in case of alarms) or delayed (e.g. in case of trend information and lifestyle recommendations) to relevant participants using personalised multi modal interfaces, potentially across multiple spaces.

- **Communication:** Sensors and actuators are connected to one or more reasoning systems which in turn might be connected (even dynamically e.g. a person moving from home to vehicle to some public space) to other reasoning systems with optional additional actuators.
- **Interaction:** intelligent interaction for persons with systems and services is a very important aspect for the applications and will have specific requirements to cope with the abilities of people.

It is of course of great importance that solutions from these technology domains and applications and services built on top of them are able to work together by sharing data and understanding each other. This leads to interoperability requirements and as a consequence to standards to formalise this.

1.4.1 Ageing at home

In the coming decades societies have to deal with changing family structure. Family ties are still strong, but due to increased mobility, geographic dispersion within the families is increasing. With higher life expectancy (47 years in 1900, almost 80 years today), better education, higher income and better health conditions and the trend towards a „compression of morbidity“ (reduced age-related suffering), more older people will remain alone (in their own home) for many years after the death of their partner, especially women. With these societal changes, living conditions and lifestyles of older people will become more diverse and heterogeneous. The population will age in quantitative terms and while at the same time some parts of the older population will get younger in qualitative terms (“third” and “fourth” age). The very meaning of “senior citizen” is changing and probably has to be interpreted more dynamically. Extending older people personal autonomy and participation over time at home is therefore a necessity and a challenge in the years ahead. Home-based care has to be provided as long as possible, and when the quality of life is ensured, remaining at home can slow down cognitive and physical decline of an older person in need for long-term care. However domiciliary care is staff- and cost-intensive, and the demographic change will lead to a situation where less younger and middle-aged people will be available for recruitment in the care sector. An increasing number of older people will be demanding home-care and health care although personnel and financial constraints increase at the same time.

The argument that technologies could extend older people’s personal autonomy and participation over time and provide the right level of assistance and care is obvious. Main application fields for Ambient Assisted Living (AAL) technologies in this domain are

- **Health, Rehabilitation and Care**
 - Person-centric health management
 - Tele-monitoring and self-management of chronic diseases
 - Support to care givers, care organisations and patient networks
- **Prevention**
 - Promotion of healthy lifestyles
- **Personal and home safety and security**
- **Personal Activity Management**
- **Biorobotics for personal autonomy and for care**
 - Biorobotics for neuro-rehabilitation
- **Person-centric services**
 - e-shopping
 - supply with goods and meals

1.4.2 Ageing in society

Ageing in society refers to the fact that older people are a part of society as a whole and have established a wide network of connections and relations to a variety of other persons, ie. relatives, carer, neighbours, etc. Older people are therefore seen as members of specific communities (close or distant) and the aim of AAL applications is to preserve established social connections as long as possible or to provide new connections and social involvement that could act as a substitute for lost connections. Ageing in society and the problems associated with it (isolation and loneliness - leading to mental degradation) therefore are based on a holistic approach which combines technological with social and environmental innovations and provides support in a community-based setting. In modern societies informal support networks have always been a part of the care that was provided to older citizens. With higher life expectancy and lower reproduction rates, these traditional informal networks are in danger to be overburdened. AAL should help to strengthen and support the existence or evolution of established and the setting-up of new social network of older people in a community. Also AAL technologies should contribute to establish a balanced arrangement between the different formal and informal care providers in the ageing society. In this sense, AAL has to be seen within the broader experience of living and positive ageing in society, in our cities and in our communities (i.e. WHO Global age-friendly cities – see the process of optimising opportunities for health, participation and security in order to enhance quality of life as people age - Active Ageing: A Policy framework, WHO 2002)

Technologies and applications that stimulate and prolong independent and active participation in the community are therefore an essential part of AAL. Main application fields for Ambient Assisted Living (AAL) technologies in this domain are:

- **Mobility**
 - Support of individual physical mobility
 - Ambient assisted driving
 - Public Transportation
- **Social Inclusion**
 - Social networks
 - Participating in the community
 - Learning
- **Entertainment, Leisure**

1.4.3 Ageing at work

Ageing at work is related to the 2nd age (in contrast to the 3rd and 4th age) and the years before retirement. There is a clear policy rationale in most European countries to keep people longer in work due to demographic developments and necessary pension system reforms. More and more employers also realise that the sudden loss of older experienced employees severely harms their business („senior brain drain“). On the other side, work (the activity and the networks it involves) is an essential part of active living for people as they grow old and is appreciated as such. Therefore AAL technologies could play a vital part in keeping older persons in the work place longer and in improving their working conditions – based on part-time models which most older people prefer. It should not be forgotten that work is not only a valued activity, but could also be a cause for burdens. AAL solutions could give necessary support here when mental and physical capabilities decline.

But speaking of „work“ also has other connotations. Work in the community – as voluntary/informal work in the 3rd sector. AAL applications could also be beneficial for professionals in the care sector and those employees outside the care sector that are

involved in caring for a relative. Here AAL solutions could support the carer and care organisations in managing and organising daily care activities and provide assistance/guidance for non-trained carers who are in danger of getting overcharged by the burden and demands of care itself and by managing their job and care duties at the same time. These are issues closely related to the other domains of ageing at home and ageing in society.

Talking about ageing at the workplace in a narrow sense, the most important application areas in ageing at work are:

- **Collaboration, Cooperation, Tele-working**
- **Workplace design (human machine interface)**
- **Knowledge dissemination**
- **Health support in the workplace**

In general ageing at work is about solutions that enable flexibility in place and time of work and help older employees to contribute their knowledge and experience at their workplace and compensate for any degradation of physical and mental ability. However, it would be misleading to solely focus on a “deficit model” of ageing. Needs *and* strengths (knowledge, expertise) of older employees should be taken into account also in AAL-related research.

1.5 AAL Stakeholders

A large number of stakeholders are involved in AAL some very direct others with a more indirect relationships. To reflect this, stakeholders are grouped in the following categories: primary, secondary, tertiary and quarterly stakeholders.

Primary stakeholders, actors that are the actual users of the AAL solutions

- **Clients, elderly, people with chronic diseases and disabled persons** as the main target group for the systems and services including people experiencing physical, mental or social limitations (self-perceived),
- **Care givers**, to be supported in their work on behalf of the main target group (i.e. professional caregivers like: clinicians, general practitioners, nurses, home care nurses, pharmacists, physiotherapists, and dieticians, but also informal care givers like: relatives, friends, neighbours, and others supporting in home tasks and personal care).

Secondary stakeholders, involved in organising the processes and procedures for the primary stakeholders

- **Organisations offering services to the main target group** like: security service providers, care service organisations (laboratories, home care organisations, medical institutions, disease management organizations, activity and health monitoring services, emergency response centres, tracking services, etc.), shopping services (real shops as well as web based shopping), transportation services, delivery services, social services, community centres, etc.

Tertiary stakeholders enabling AAL by supplying goods and services

- **Suppliers of goods** (such as the pharmaceutical industry, food industry) which might need to conform to electronic readability of packages (e.g. blister for pills, ingredients of products, ...)
- **System, technology and infra-structure providers** like: suppliers of equipment and applications, tele-monitoring devices, environmental sensors, security systems, tracking devices, communication providers, construction companies, installation services, knowledgeable distribution channels
- **Educational organisations** e.g. related to new professions and for new tasks in existing professions

Quarterly stakeholders involved in defining the economical and legal context for exploiting AAL.

- **Payers** (Insurance companies, employers,)
- **Governments, local authorities, European Commission** (with respect to legislation and regulation),
- **Standard development organisations** either formal standard organisations or industrial association and their contributing members.

2. Barriers

Before the full potentials of the AAL research and market in Europe can be unleashed several obstacles have to be overcome. One has to notice that several layers of barriers characterise the current environment.

2.1 Market Perspective („Pull“)

Diversity of social, welfare and healthcare systems in Europe

In Europe the environment of national health care and social security systems is rather heterogeneous. This hinders the development of common (European) business models and a common market for AAL solutions. Currently, reimbursement schemes do not encourage the adoption of technological innovations in these systems and provide no clear perspective to link investments and revenues/savings for adopters. At the same time, investors and developers have to deal with a wide variety of welfare, healthcare and care systems in European countries. Each of these systems provides a complex legal and regulatory basis which restricts or encourages the use of AAL technology in the public healthcare and care services in specific ways. Some countries have established welfare structures that are more open to technological change (e.g. tele-monitoring in the National Health Service UK), others – despite huge social reforms in the past – still lack basic prerequisites to handle the upcoming demographic change (lack of care insurances in the Eastern European states) which could also benefit AAL adoption. This is seen by most experts as the main barrier for a wide adoption of AAL technology in the public sector. Since social policy in the European Union is coordinated relatively loosely (i.e. by OMC), this diverse welfare structure will not vanish in a short time, and a common European Social model seems to be beyond reach in the next decades. In this sense R&D policy deals with problems beyond its reach – but could nevertheless raise awareness for the issue.

Another entry barrier relates to different national regulations for medical and care related services. In almost every country there are (clear) standards and professional and educational obligations imposed on providers and suppliers of services in the healthcare sector. On one hand, these standards secure quality and reliability of these vital services.

On the other hand they are only slowly adopted to the fast developments in ICT in the health sector and could raise barriers for market entry for new innovative services and products. The same is true for privacy and data security issues and regulations. Nowadays, the public opinion is highly concerned with privacy and data security issues. Therefore governments are reluctant to promote solutions that tackle the common understanding of privacy (in the home) and could lead to fear of „surveillance“ and sometimes a negative view of these applications.

Lack of visible value chains

In both the more regulated markets of healthcare/care and the consumer-oriented private markets the lack of visible value chains is obvious. This might be seen as an indicator for the nascent state of the AAL industry. Right now, AAL activities seem to be bound in the R&D sector – business models are only discussed cursory. There is a vicious circle in place: No products are available on the market, there is no experience and data about user acceptance and (cost-saving/health-promoting) effects of products and service which leads to lack of commitment and engagement on the industry side and (health care and care) service providers, no business models are developed and tested.

Also there are a number of possible value networks with different types of actors. And there are several stakeholders with different interest configurations: Healthcare and care providers, (IT) industry, insurers, real estate developers, patients and relatives and governments/local authorities. It is quite clear that each of these groups itself is heterogeneous and that various subgroups could be labelled in terms of size, legal status, potential needs/demands and expectations towards AAL products and services – not to speak about national and regional differentiations in the target groups.

Heterogeneous target groups (user/buyer)

There is also very limited knowledge about the potential target groups for AAL solutions. In principle we can distinguish the following **user** groups: healthy elderly (independent users), partially disabled (physical and/or mentally) elderly, (dependent users), 2nd level users like carers and relatives. Potential **buyers** of products and service are elderly, healthcare and care organisations (private & public), insurers (private & public), real estate companies, relatives and other informal carers in the community, etc. It is quite clear that each of these groups itself is heterogeneous and that various subgroups could be labelled in terms of size, legal status, potential needs/demands and expectations towards AAL products and services – not to speak of national and regional differentiations in the target groups. Older people for example, are partly very demanding (elite) users, with increasing personal wealth and ability to pay for things at the right price and quality. Also there is a lot of diversity in terms of needs and changes during the life of an older person. Also stigmatization is an issue – future product packaging and marketing needs to be appropriate. In some cases, it would be best to avoid „niche products“ and look for products/services that are adaptable to the needs and demands of a wide range of potential customers.

Impact and acceptance

No long-term results regarding the cost and labour saving effects of AAL technologies are available at the moment. These effects and their relation to the costs of AAL applications must be identified, secondly the needs of the actors and the stakeholders involved need to be taken into consideration and then the appropriate solutions and the technologies related to this has to be chosen. Economical/social benefits and functional benefits for the users have to be the starting point. Another problem is the lack of knowledge and acceptance on the side of care organizations and users alike. Because of this social and health politicians are reluctant to provide financing of AAL related services or to put them on the list of accepted treatments of statutory insurances respectively. There is also low acceptance by older people. Intermediaries such as professionals have an important role in the communication with elderly people.

Lack of standards and certification

In the long run, established AAL related standards and certification procedures are necessary to provide reliability and trust to buyers and users. This is a crucial topic since developing, negotiating and implementing technical standards is a time-consuming process. Global industry players and consortia (Continua Alliance) are already active and marking the playing field. It might be that the window of opportunity for a European approach in AAL standards is closing – although the demand for “open standards” in the AAL R&D domain (in contrast to incremental standards imposed by transnational industry incumbents) might provide further opportunities for an independent European strategy in this field. In addition to technical standardisation the need for new AAL related standards might also arise in the formerly non-technical domains of healthcare and care services. Here standards for quality management and service quality and reliability have been discussed for some time. The emerging AAL sector could bring the need for completely new standards and professional regulations in this area when new products and services - combining ICT and human care – need to fulfil privacy and ethical standards and have to secure quality and reliability in the critical domains of healthcare and care for the elderly. It should also be mentioned that the combination of new innovative technology with healthcare and care sciences typically for AAL might raise the demand for a specialised and educated workforce in this area – both on the developer and user sides of AAL. Professional education, training and qualifications might be necessary to fulfil the workforce demand of the upcoming industry. In the field of Gerontology it took several decades to establish separate education and training for the eminent and important field of Gerontechnology – it is likely that the same occurs for the even more innovative and complex field of AAL. Potential users in the care and healthcare sector need to be trained in order to benefit from AAL applications to the full extent.

2.2 Technology perspective („Push“)

Standards and reference design

Ambient Assisted Living technologies usually involve a heterogeneous set of disciplines. Technology convergence is a strong enabler for AAL solutions. Convergence enables ubiquitous access, awareness, ubiquitous robotics for autonomy and new applications and services. But convergence also raises the important question of standards and reference designs such as:

- Domain models: concepts, functions and qualities for AAL systems to make the demands, contributions explicit
- Open reference architecture facilitating efficient integration of diverse assistance devices and services into personalized, trustable and manageable assistance solutions
- Standardized solutions for unobtrusive, affordable sensing of context (location, activity, vital data)
- Advanced user interfaces that can be adapted to the changing needs of the users
- Guidelines for privacy and security of data management
- System management and interoperability of heterogeneous components

However, a generic AAL service platform based on certain standards as the basis for 3rd party application development is missing. This would stimulate the products and service market development tremendously.

The AAL domain described above consists of a large set of independently developed systems and services which existing environments. These systems and services should be

able to communicate with each other not only by exchanging data but also understanding each other's data. This can only be achieved by agreeing on a lot of issues - in other words by using standards. Standards are of enormous economic importance: By determining both the requirements producers have to fulfil and the expectations of the customer, standards reduce problems of risk, transaction costs and issues of interoperability.

There are several barriers related to the deployment and adoption of standards, some examples are:

- Focus on internal efficiency: An important barrier seems to be that AAL service providers focus on their own needs; they may find internal process efficiency more important than commonly used standards to enable an integrated use of their services in a larger context.
- Standards not designed to user needs: It may be that available standards are not sufficiently designed to fulfil user needs.
- Ignorance about standards: system and service providers may not be aware of existing standards.
- Implementation costs: Costs of becoming acquainted with the complex specifications and documentations of standards or the costs of hiring experts may appear to be too high, particularly with regard to sometimes incompatible updates.
- Migration costs: The costs of migrating from proprietary solutions to other applications that support fairly common standards may be too high. For example there may be a need to convert massive amounts of data before new software compliant with standards can be implemented
- Lack of financial incentive to electronically exchange data with other AAL providers, which would make the benefits of commonly used standards more obvious.
- Lack of certification: When a certification authority for the relevant standards is lacking, potential applicants may lack trust that the standards work properly so that benefits of implementing them outweigh the costs

Flexibility and adaptability

Every person and his health and fitness are different and constantly changing: therefore systems need to be highly configurable and flexible in terms of the evolution of the person, changing conditions and multiple diseases, and (care) organisation diversity. Approaches in general should be people-centric and life-course-based. Such a holistic approach means also that other scientific disciplines must be involved in research. E.g. science-based gerontechnology can provide improved knowledge of age-related changes in human functions and is therefore an important part of AAL research.

User involvement

Adaptable personalized user friendly interfaces integrated in real-life environments are needed All stakeholders should be aware that user involvement is key for technological, innovative and business success in AAL – from first concepts to systems design and integration to prototypes and business models. Questions of design and usability are of similar importance to AAL products and the involvement of design and usability experts is also essential for developments with more than minor survival chance in the “real world” outside the labs. But design and usability concepts should not become substitutes for real user involvement. Only few R&D projects in Europe have tackled this issue in consequence

and secured the involvement of users to full extent³. Living labs are one way to development and implement user-driven approaches in product and service development.

3. Policy measures

Living and ageing well in society as a policy vision

A study recently conducted for the European Commission showed, that national governments serve as main drivers of developments within the area of ICT enabled independent living in member states⁴.

Governments have to see AAL within the broader experience of living and positive ageing in society, in our cities and in our communities, i.e. WHO Global age-friendly cities (The process of optimising opportunities for health, participation and security in order to enhance quality of life as people age - Active Ageing: A Policy framework, WHO, 2002). Therefore collaboration across policy sectors and borders is needed since several branches of government on different levels are tackled by the AAL issue: social security/welfare/work, care and healthcare, communications & media, housing & land usage, economy & employment on regional, national, and European levels. The involvement of all stakeholders: real estate, cure, care, welfare, technology and service providers should be stimulated in order to come to a commonly-shared vision of AAL in Europe. The issue of ageing at work should be seen in conjunction with the new European Employment Guidelines/Integrated Guidelines for Growth and Jobs and with policies for the reconciling of family and working life and work-life-balance.

On the other hand, the role of local communities and the role of AAL as a tool for empowering the local community should be emphasised. The local community needs to be central part of the value chain. Community-centred innovation is more likely to last in time. Still in many rural areas in Europe, the basic infrastructure for implementing AAL is still missing. In some cases, only 15% people over 65 have access to the internet. Therefore the basic foundations for wide adoption of AAL still need to be constructed in several regions which includes the challenges of digital literacy and social exclusion.

Government should also play an active part in stimulating and shaping the future AAL market. This relates especially to changing regulations and reimbursement schemes in the healthcare and care sector. Since public agencies or government controlled institutions still form a viable part of the care and healthcare sector in some European countries, the demand for AAL services from these organisations should be made explicit. Public innovation procurement could be a way to achieve this. The support for no-profit AAL service models in the public sector could nevertheless have a positive economic impact by demonstrating the use and ROI of the applications. Questions of (proprietary vs. open) standards and certification are of similar importance and should be addressed by governments. In general governments should promote partnerships, not only with industrial and research institutes but also with organisations from the respective user domain and with special expertise. Convincing application examples of reasonable size are still missing: support for experiments of scale and business evaluation through public co-financing could be an answer. In order to avoid the pitfall of waiting for harmonisation and regulation, „Lego-like“ flexible and modular business models are needed that can cope with the diversity of care/social models in EU Countries. Innovation in services is generally underrated: sometimes they are “a big fruit, hanging low, ready to pick”. Wherever possible, existing and

³ Best Practises in Europe on ICT enabled living for elderly – Unpublished study for the European Commission, DG Information Society and Media, May 2008

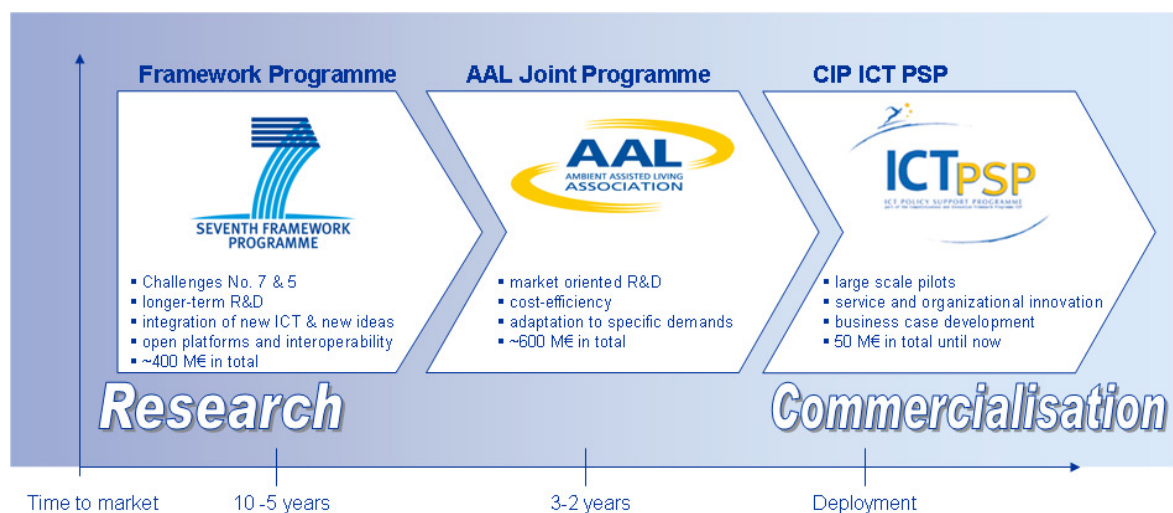
⁴ Best Practises in Europe on ICT enabled living for elderly – Unpublished study for the European Commission, DG Information Society and Media, May 2008

applicable standards should be re-used or extended. Public-private-partnerships in this respect should be considered.

Still, awareness for AAL technologies and applications among public and private service providers is low. Measures for awareness rising could involve: conferences for healthcare and social care officials, conferences for homecare service providers & equipment manufacturers, promotion of best practice solutions. Apart from networking efforts such as conferences, workshops and online tools, existing AAL products and services (prototypes) are the best way to demonstrate the benefit and value of AAL for a joyful and dignified life of the aging society in the future. This includes the active involvement of SMEs to secure the flexibility and time-to-market perspective of the developing AAL community.

Research and innovation policy

Currently there are several funding programmes for AAL, but there is a lack of coordination of these EU and national R&D funding. The different funding instruments differ in time-to-market perspective and in scope characteristics (basic research vs. application-focused). Funding programmes should be considered as a sequence: from basic R&D for technology, application and service development to trials. It is an open question whether it would be possible to streamline these three pillars so they would cover a whole innovation cycle for a technology from basic research to market entry.



Also the role of national programmes and regional undertakings in this constellation should be taken into consideration here.

In **basic research** (FP7) a full older-persons life-cycle approach which includes social and environmental factors should be promoted for AAL related research. Other disciplines like Gerontology should be involved and possible links to HERA („Humanities in the European Research Area“) for social policy impact and for better understanding and addressing the community dimension should be observed. More basic (social, medical and psychological) research needs to be conducted on how people do actually age well. Cross-sector-based longitudinal studies of physical status and behavioural analysis during the aging phase would be useful to develop better insights.

Infrastructure funding for the establishment of additional **living labs and/or integrated (regional) communities**⁵: Living lab approaches are keys to secure user perspective in AAL research and to raise awareness (see below). Technical infrastructures are needed for many applications which today are not available yet or seem to be too expensive or not adequately adapted to the needs of older adult persons. In many cases the test and validation of prototypes falls short. A **European network of integrated communities** (integrated AAL

⁵ Here also regional development funds could play an important role.

experimentation/assessment spaces or living labs in the community) for real life testing technology and organisational solutions (public private partnership) might be a reasonable aim and a way to enable innovations to advance from concepts to market rollout, and contributes to knowledge gains. Scientist exchange and related education/training programs might be a solution for the upcoming specialists and workforce demand in AAL.

AAL, its development and application are complex issues - and many different (technical, market, regional) **stakeholders have to be integrated** into the development of solutions. Cooperative research projects with a prominent role of service providers and user integration (which is new for many countries) should therefore be fostered. **Proactive involvement of end-users** (User centric design) is a necessity in all R&D projects. User involvement is a key priority in AAL related R&D and should be prerequisite both for programs on the European and national level. Also the issue of business models, privacy/ethical topics and design requirement should be kept in mind when setting up respective programs. The topics of **standardisation and impact measurement procedures** on several levels of cost-saving/health promoting effects of AAL applications are essential for the future success of the area:

- Developing design guidelines (based on existing standards) that will enable vendors to build interoperable sensors, home networks, telehealth platforms, and health and wellness services.
- Establishing a product certification program with a consumer-recognizable logo signifying the promise of interoperability across certified products.
- Collaborating with government regulatory agencies to provide methods for safe and effective management of diverse vendor solutions.
- Working with leaders in the health care industries to develop new ways to address the costs of providing personal telehealth systems.

There are several topics in the **7th Framework Programme** that are generic and concentrate on enabling technologies often not specific to AAL. Currently, there is funding for horizontal activities, but we lack **funding for vertical activities**, e.g. accessibility or usability issues, old people's specific needs for interaction, etc. Such a topic could be a FP7 project for benefit of multiple application domains.

In the **AAL Joint Programme** key thematic areas, which constitute promising markets ("quick wins"), should be identified in which R&D funding should have priorities. These „low hanging fruits“ are service solutions based on existing technologies, standards and infrastructures. This will encourage SME and service/care provider participation and give necessary insights about user motivation and raise awareness. In these areas products/services, business models, markets intelligence, value chains and networks should be explored with combined resources from the public and private sector. These areas could serve as "role models" for other areas to be developed. Again, collaborations/involvement of all users/stakeholders along the value chain in R&D projects is essential. Also the **specific European aspects of AAL** (which are related more to the heterogeneous market conditions, than to generic medical or technical issues) could be addressed. On the other side, too narrow AAL calls may introduce a distortion in the research strategy of the players. The contradictions between narrower vs. broader "call for papers" and focus vs. creativity have to be considered carefully.

All **AAL innovation activities** should have a broader scope: Technology R&D complemented with service innovations, organizational innovations and social innovations, which includes the support of grassroots-generated innovation in the community. The **open innovation concept** could be adapted in hospital and care environments.

More funding of **product development** and **large scale trials** is needed. But both are urgent necessities in order to provide evidence-based research proof for the health related and cost cutting impact of AAL solutions. This is related to healthcare re-imburement schemes where the barrier of evidence is hindering adoption at the moment. Also continuity of research is a problem: **evidence-based research** proof is impossible even in a 5 year time-frame. This requires longitudinal and cross-project evaluation and impact measurement projects for evidence and policy development.

Community building

Enhanced efforts in networking and community building could be an answer to handle some of the barriers related to information problems (market information, technology complexities, user perspective, business models or value chains). With research underway in FP7 and the CIP, a strategic mapping of research topics would be beneficial for all stakeholders. Several stakeholders still are not involved enough, e.g. the real estate industry, insurers and care professionals.

The case for an AAL European Technology Platform

The AAL sector today is highly fragmented in terms of stakeholder, actors, market environment (regulated/consumer-oriented), uncertainty about possible business models and the technological basis and standards. This could foster the establishment of a European Technology platform as a way to stimulate community building and the establishment of a common European AAL vision and the development of common solutions for the barriers and obstacles in the AAL sector described above from an industry point of view. There is already interest and also commitment from European industry to form a more formal AAL community in the future, a variety of stakeholders is willing to join forces to push the AAL theme from vision to market. The establishment of an ETP would be an important step towards this aim and opens up new possibilities of private-public-partnerships for the future. Taking into account the problems the AAL sector faces in Europe measures beyond the existing R&D programmes on larger scale and with a long term perspective should be considered. A Joint Technology Initiative (JTI) might be a way to implement public private research partnerships to implement the ambitious research priorities within AAL and to mobilise public resources (FP7, European Investment Bank) and private investments (risk capital) to solve some of the problems mentioned above. The foundation of such an undertaking is a European Technology Platform with a substantial number of relevant stakeholders and a clearly defined Strategic Research Agenda involving jointly defined research needs and priorities. A JTI could then be the next step to implement large-scale applied and industrial-based research activities based on the needs identified by the ETP.