AALIANCE2 Roadmap
A positive perspective
September 11, 2014
AAL Forum, Bucharest

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AALIANCE2 is a Coordination Action funded by the European Programme FP7-ICT-2011.5.4 (Project reference: 288705)
AALIANCE2

Next Generation European Ambient Assisted Living Innovation Alliance

Funding scheme: Coordination Action (CA), FP7-ICT-2011.7

• Investigating the current SoA and market developments in AAL in Europe, North America and Asia, addressing possible Business models;

• Further developing the AALIANCE2 AAL Roadmap and Strategic Research Agenda for future technologies and applications;

• Addressing standardisation issues and initiating corresponding standardisation activities;

• Enhancing the sustainable network of AALIANCE involving the major AAL Stakeholders;

Consortium
1. Scuola Superiore S. Anna, IT
2. OFFIS, DE
3. Deutches Telekom Ag, DE
4. Tunstall, UK
5. Tecnalia, ES
6. Age Platform, BE
7. VanMorgen, NL
Ageing well (@home, @mobile)
PERSONAL AUTONOMY AND WELL-BEING

Ageing well in one’s social environment
PARTICIPATION

Ageing well in one’s working environment
ACTIVE AND PRODUCTIVE AGEING

PREVENTION
Task supporting cognitive and motor abilities before severe disease (i.e. Health periodic monitoring, fall prevention..)

COMPENSATION & SUPPORT
Task supporting cognitive and motor abilities after severe disease (i.e. Smart walker, pedestrian GPS,..)

INDEPENDENT & ACTIVE AGEING
Task supporting independence of elderly (i.e. Social inclusion, work, leisure and entertainment,..)

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Ambient Assisted Living Roadmap
July 2014

Ambient Assisted Living Strategic Research Agenda
July 2014

AAL Forum 2014
Bucharest, Romania
September 09-12, 2014
Roadmap and SRA 2014: Workflow

ROADMAP

Stakeholders’ Needs

AAL Service Areas & Scenarios

Technological Gaps

Transversal Issues & Recommendations

SRA

Key Service Scenarios

Key Enabling Technologies (KETs): Challenges & Timeline

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User needs & Recommendations

- 3 Exhibitions (AAL Forum 2013, ICT 2013, ForItAAL 2013)
- 7 workshops in Europe (200+ stakeholders)
- Questionnaires (130+ stakeholders)
- Online survey (40+ stakeholders)
- 1 Conference (Brussels, March 2014)
- 3 Exhibitions (AAL Forum 2013, ICT 2013, ForItAAL 2013)
- 7 workshops in Europe (200+ stakeholders)
- Questionnaires (130+ stakeholders)
- Online survey (40+ stakeholders)
- 1 Conference (Brussels, March 2014)
Roadmap and SRA: Workflow

Stakeholders’ Needs

Examples:
- Secure environments
- Contacts with friends, family, society
- Healthcare in my home, comfort, peace of mind
- Appropriate response when things go wrong
- Be able to work ...

AAL Service Areas and Scenarios

- Prevention
  - Scenarios for Prevention
- Compensation and Support
  - Scenarios for C&S
- Independent and Active Ageing
  - Scenarios for I&AA

Key Enabling Technologies

- Sensing
- Reasoning
- Acting
- Interacting
- Communicating
We are talking about...

WHAT?
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Some of their roles in the society

WHAT?
Older people usually contribute to society (volunteer)

1. Charitable giving, caring for family members and civic engagement of all types;
   – informally, outside their immediate families;
   – formally, through groups and organizations.

There is clear evidence from scientific studies that volunteering benefits health.
Customs

- Old people handed down customs, traditions, experience and wisdom from generation to generation.
Longevity economy (1)

- People in their 50s and 60s start businesses at nearly twice the rate of those in their 20s, because they have the capital, the credit, and, often, a wealth of experience that younger workers lack.

They already inject some $4.6 trillion a year in spending on consumer goods and services, including health care,
Grandparents and grandchildren

• Older grandparents (those aged over 65) are usually asked raising their grandchildren
Longevity economy (2)

- Provision of some form of financial support to their adult children

Fig. 7: Financial assistance to adult children
Parents aged 47–65 who have provided financial support to adult children

- Helped with college loans or tuition
- Allowed to move home rent free
- Helped to buy a car
- Helped with car insurance
- Helped with rent or utilities
- Co-signed a loan or lease
- Helped with medical insurance
- Helped with paying credit card debt
- Helped with house down payment
- Helped with a mortgage payment

Source: Ameriprise Financial
Older people contribute to society (work longer)

Projections for changes to the employment rate between 2010 and 2060

Source: Eurostat 2012
1. Active ageing is an important opportunity for society because healthy and active older citizens can continue to contribute to the growth and welfare of the communities in terms of support to their children and grandchildren, voluntary work, consumption and purchases, work, etc.
The presence of old people in the society is first of all an opportunity
The good thing???
There are a lot of elderly people

Projected structure of the population by age group, EU-27, 1 January 2010

<table>
<thead>
<tr>
<th>Year</th>
<th>Millions</th>
<th>% of total population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1950</td>
<td>130.5</td>
<td>5.2%</td>
</tr>
<tr>
<td>2000</td>
<td>417.2</td>
<td>6.8%</td>
</tr>
<tr>
<td>2050</td>
<td>1,486.9</td>
<td>16.2%</td>
</tr>
</tbody>
</table>

Population aged 65 or more for the world


Source: Eurostat (online data code: proj_10c2150p)

Source: Author’s graph, based on data from UN (2011)
1. Senior people live in rural areas and big urban areas, so well distributed in places.
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BUT

They are frail
The data revealed that on average men have higher incidence of fatal diseases and death, but women experience more disability.
Management of multiple and chronic diseases at home

1. Chronic conditions are those that last a year or more and require ongoing medical attention and/or limit activities of daily living; Examples include arthritis, diabetes, heart disease and hypertension;
Risk of accidents

1. Older persons, and especially those aged 75+, are more at risk to have accidents and in particular falls (physical weakness or effects of polypharmacy);

Rate* of Nonfatal, Medically Consulted Fall Injury Episodes,† by Age Group

Cost of Fall Injuries in Older Persons in

Graphic source: MMWR Quickstats, 02/03/2012
Insecurity, vulnerability, loneliness and depression;

1. Older persons who live alone and/or had negative experiences (like accidents, falls), may strongly perceive their loneliness and vulnerability;

2. Consequently depression and premature degeneration of both physical and cognitive health occur.

Overall, research suggests that loneliness is as much of a threat to health as smoking or obesity.
Maltreatments

1. A study of the World Health Organization highlighted that in Europe annually about 4 millions of elderly older people are subject to maltreatments and abuses that often cause premature deaths;

2. There are several forms of abuse:
   - physical,
   - psychological,
   - financial,
   - sexual
   - medical abuse.
So....

It is easy!!!
We have to take care of them
Informal caregivers

- The term ‘informal caregivers’ pertains to unpaid persons (mainly the partner, but also other family members, friends, neighbours, etc.);
- In the majority of EU countries, informal caregivers undertake on average 60% of care requests;
- These individuals manage a wide variety of tasks, from health care and therapy management to support for Activities of Daily Living (ADL) (bathing, dressing, cooking, cleaning the house, etc.);
- These informal carers often have difficulty finding a good balance between their caring role and other activities of their life (work, family, leisure, etc.)
The U.S. Bureau of Labor Statistics has predicted that occupations in healthcare will dramatically change.
Quaternary stakeholders point of view

- To make healthcare and long-term care services **efficient and financially sustainable**
- To **facilitate the access to services** by all citizens (smart cities and infrastructures)
- To have **healthy and active citizens** contributing to the welfare of the community
- To **revise regulations and funding instruments**
Healthy and active citizens contributing to the welfare of the community

- It is fundamental to **keep citizens healthy**, active and involved in the community life as long as possible;
- governments should encourage actions devoted to **disease prevention and the adoption of healthy life styles**;
- these preventive activities should be promoted to **all citizens**, young persons, adults and older people.
A model for Active and Assisted Living
Service Areas

- Prevention
- Compensation and Support
- Independent and Active Ageing

PREVENTION
Task supporting cognitive and motor abilities before severe disease (i.e. Health periodic monitoring, fall prevention,)

COMPENSATION & SUPPORT
Task supporting cognitive and motor abilities after severe disease (i.e. Smart walker, pedestrian GPS,)

INDEPENDENT & ACTIVE AGEING
Task supporting independence of elderly (i.e. Social inclusion, work, leisure and entertainment,)

Quality of Life

ΔQoL

ΔAge

Without AAL devices and services
Effects of AAL4prevention
Effects of AAL4support and compensation
Effects of AAL4independent and active ageing
Analysis of elderly life

Quality of Life

Age

Without AAL devices and services
Prevention

“Action to reduce or eliminate the onset, causes, complications or recurrence of disease”

Primary Prevention
Activities to avoid and delay specific diseases

Secondary Prevention
Actions taken to delay the onset of significant morbidity

Some examples:
• Point of care
• Neurodegenerative Disease
• Safety at Work
Analysis of elderly life

PREVENTION
Tasks supporting and maintaining cognitive and motor abilities before severe diseases (i.e. health periodic monitoring, fall preventions, etc.)

Without AAL devices and services
Effects of AAL4prevention

Quality of Life vs. Age

ΔQoL
Compensation and Support concerns elderly people with physical or cognitive impairments that need help in their daily activities.

Technology should be part of the integrated care ‘chain’

- Monitoring and Assistance
- Personal Management of Chronic Diseases
- Daytime management
- Support in Driving
- Rehabilitation assistance
Analysis of elderly life

Without AAL devices and services

Effects of AAL4prevention

Effects of AAL4support and compensation

PREVENTION
Tasks supporting and maintaining cognitive and motor abilities before severe diseases (i.e. health periodic monitoring, fall preventions, etc.)

COMPENSATION & SUPPORT
Tasks supporting cognitive and motor abilities after severe diseases (i.e. smart walker, pedestrian GPS, etc.)

Quality of Life

ΔQoL

Age
"Active ageing aims to extend healthy life expectancy and QoL for all people as they age, including those who are frail, disabled and in need of care."

- Safety and security
- Keeping social contacts
- Age Friendly Environments
- Keeping control over life and decisions
- Being able to work longer
- Appropriate response when things go wrong

Wish to remain at home feeling safe, avoiding social isolation thus being involved in society and keeping contacts with friends and family.
Analysis of elderly life

- **PREVENTION**
  - Tasks supporting and maintaining cognitive and motor abilities before severe diseases (i.e. health periodic monitoring, fall preventions, etc.)

- **COMPENSATION & SUPPORT**
  - Tasks supporting cognitive and motor abilities after severe diseases (i.e. smart walker, pedestrian GPS, etc.)

- **INDEPENDENT & ACTIVE AGEING**
  - Tasks supporting independence of elderly (i.e. social inclusion, work, leisure and entertainment, etc.)

Graph showing changes in Quality of Life (ΔQoL) and Age (ΔAge) with different scenarios:
- **Without AAL devices and services**
- **Effects of AAL4prevention**
- **Effects of AAL4support and compensation**
- **Effects of AAL4indipendent and active ageing**
Social Innovation and integrated community

- The deployment and adoption of AAL technologies in the real daily life requires a strong innovation at the level of the service organizations because they should be designed, and managed in order to provide to older citizens all kinds of health and social services;
- Community services should be organized in network in order to provide high quality support to each user, optimizing the resources and avoiding redundancies;
- AAL culture should be promoted, above all for end-users.
10 Key Service Scenarios

Prevention of the early degeneration of cognitive abilities
Healthy living
Management of Chronic Diseases
Aging-Friendly and Safety Environments

Fall prevention
Management of daily activities and keeping control over own life
Keeping social contact and having fun
Outdoors mobility (i.e. pedestrians, public transport and private cars)

Avoiding Caregivers Isolation
Senior citizens at work

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AAL Market

- Reviewed existing models - found few solutions that include components from three domains - most focus in the overlapping space of any two
- Used ICTechnoAge study findings to identify cases for AAL reference business models
  - Scottish telecare
  - Simap
  - SOPHIA
- Looked for potential managed service models
  - UK embracing the managed service approach
  - Spanish government is working to define service outcomes consistent with the UK’s approach
  - Germany mostly focused on telecare. Telehealth still mostly small trials (700+) with the goal of demonstrating effectiveness mainly for insurance institutes

(Kubitschke & Cullen, 2010)
Business Models update

Managed Services Examples

- Transfer of **responsibility to a 3rd party service provider** – offers the potential to accelerate the development of a more integrated offering by managing the whole value chain on a fee per service basis.
- A variety of revenue models
  - Equipment only
  - Equipment plus call centre
  - Full service from referral to response

![UK Telecare example diagram](image-url)
Telecare in Spain

- In Spain, full **delegation of telecare services to a single provider** is now the norm. Ease of interaction with a single provider appears to be the main reason for outsourcing under a ‘managed services’ model.
- The revenue model used is a **monthly fee per user**, which would cover the equipment and all the other service provisions.
- Andalusia is an exception to the rule with a direct provision model, relying on its own public infrastructure for operations. ASSDA outsourced the equipment supply, installation and maintenance, while the call centre and contact with users remain in-house.
10 Key Service Scenarios

- Prevention of the early degeneration of cognitive abilities
- Fall prevention
- Management of daily activities and keeping control over own life
- Avoiding Caregivers Isolation
- Healthy living
- Keeping social contact and having fun
- Management of Chronic Diseases
- Senior citizens at work
- Aging-Friendly and Safety Environments
- Outdoors mobility (i.e. pedestrians, public transport and private cars)

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Managed Service Model

Prevention of the early degeneration of cognitive abilities
Management of Chronic Diseases
Aging-Friendly and Safety Environments
10 Key Service Scenarios

- Prevention of the early degeneration of cognitive abilities
- Healthy living
- Management of Chronic Diseases
- Aging-Friendly and Safety Environments
- Fall prevention
- Management of daily activities and keeping control over own life
- Keeping social contact and having fun
- Outdoors mobility (i.e. pedestrians, public transport and private cars)
- Avoiding Caregivers Isolation
- Senior citizens at work
- Senior citizens at work

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## Scenario Matrix: aligning segmentation, funding and business models

<table>
<thead>
<tr>
<th>Scenario</th>
<th>Market segment</th>
<th>Funding</th>
<th>Business Model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scenario 1: Prevention of early degeneration of cognitive abilities</strong></td>
<td>High degree of prevention aids (support, equipment, etc.) in Urban areas and moderate in Comfortable+ rural areas. In poorer rural areas financial means for prevention is limited.</td>
<td>Country specific Dependent on healthcare system. Can be privately funded, reimbursed through insurance or users may have recourse to public funding</td>
<td>This could be either the telecare or telehealth models covered in D3.2 i.e. Spain - Telecare</td>
</tr>
<tr>
<td><strong>Scenario 3: Management of chronic diseases</strong></td>
<td>Comfortable+ and Less Affluent (rural and urban). Many countries offer services for the management of chronic diseases.</td>
<td>Depends on national healthcare system. For many there is government funding or combinations of private and insurance reimbursement. There is a lot of movement towards marketing direct to the users, making some products privately funded.</td>
<td>The Telehealth models as described in D3.2 (UK, Spain, Germany) are the best fit models for this scenario.</td>
</tr>
<tr>
<td><strong>Scenario 4: Age-friendly and safe environments</strong></td>
<td>Offered to a high degree in rural and Urban areas. Prevalent in countries that allow this to be funded by healthcare system.</td>
<td>Available in many countries with a combination of funding (private, insurance and public).</td>
<td>The UK telecare model covers the range of services offered for Age-friendly and safe environments.</td>
</tr>
</tbody>
</table>
Do we have technology?

YES
The market perspective: electronic health

Consumers believe they should have more access to their electronic health records

Overwhelmingly, consumers feel it is important for their medical providers to offer electronic capabilities.

- 82% book, change, or cancel appointments
- 76% receive reminders
- 73% refill prescriptions
- 69% communicate via secure email with providers
- 81% access their medical records electronically

Although the majority of consumers value electronic capabilities, most say that their current providers do not offer these services.

- 37% book, change, or cancel appointments
- 26% receive reminders
- 21% refill prescriptions
- 19% communicate via secure email with providers
- 23% access their medical records electronically

69% of consumers say that these services are very or somewhat important.
The market perspective: mHealth market

mHealth is a term used for practise of medicine and public health, supported by mobile devices.

- **Top 10 Mobile Health Apps:**
  - 97,000+ mobile apps related to HEALTH & FITNESS
  - 52% of smartphone users gather health-related information on their phones.
  - Generate up to 4 MILLION FREE & 300K PAID DOWNLOADS PER DAY

- **Do Doctors Recommend mHealth Apps?**
  - 80% of physicians use smartphones and medical apps.
  - 40% of physicians believe mHealth technologies can reduce the number of visits to doctors' offices.
  - 93% of physicians believe that mobile health apps can improve patient's health.
  - MORE THAN 25% of physicians are using mobile technology to provide patient care.
  - 93% of physicians find value having a mobile health app connected to Emergency Health.

- **mHealth User Statistics:**
  - Average age: 35
  - Male: 54%
  - 87% have a smartphone.
  - 85% use social media for health.
  - 33% of physicians downloaded a mHealth app.
  - 76% take a prescription.
  - 30% are caregivers.
The market perspective: digital impact

The Role of the Internet in Healthcare

- Services Customers find valuable if offered online via Internet:
  - 40% Appointment reminders
  - 29% Treatment reminders
  - 30% Information for managing drug side effects

- Other valuable internet services:
  - 28% Discounts or coupons for health-related products
  - 22% Information about clinical trials
  - 22% Ways to review a health care experience
  - 19% Online support groups for customers with similar health issues

Privacy in Healthcare

- 63% of customers are comfortable with storing their medical records on a cloud.
- 39% don't trust internet sites to keep my health information private and secure.

Information Customers are willing to share online:

- 25% Exercise / Physical activity
- 28% Weight
- 26% Sleep Patterns
- 20% Nutritional information (eg. calories consumed etc.)
- 25% Symptoms / General health complaints
- 15% Vital signs (eg. blood pressure, heart rate, etc.)

Cisco customer experience report for healthcare

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The market perspective: sensors in healthcare

“The whole sensor field is going to explode. It's a little all over the place right now, but with the arc of time it will become clearer.”
-- Tim Cook, CEO, Apple, 2013

Source: ON World I as seen on mobihealthnews.com
The market perspective: wearable technology

BY 2017, THE CONNECTED WEARABLE MARKET IS EXPECTED TO REACH
64 MILLION SHIPMENTS
(LARGER THAN IN 2012)

82% OF USERS BELIEVE WEARABLE TECH HAS ENHANCED THEIR LIVES

FORECAST: WORLDWIDE SPENDING ON WEARABLE TECHNOLOGY

<table>
<thead>
<tr>
<th>2013</th>
<th>2014</th>
<th>2018</th>
</tr>
</thead>
<tbody>
<tr>
<td>$1.4 BILLION</td>
<td>$1.6 BILLION</td>
<td>$19 BILLION</td>
</tr>
</tbody>
</table>

SPORT DEVICES
- SHOTTRACKER: Basketball. Tracks all shot attempts, makes and misses.
- MISFIT SHINE: Running, cycling, swimming. Tracks steps taken, activity levels, and sleep.
- INSTABEAT: Swimming. Tracks heart rate, calories, number of laps, number of flip turns and breathing pattern.

CHECKLIGHT: Football. Monitors the number of hits taken to the head during a game or practice and the severity of impact.

HEALTH DEVICES
- FITBIT: FITBIT. Tracks steps walked, calories burned, and sleep.
- PEBBLE: Pebble. Displays critical apps and notifications from a user's wrist, including music control and sleep.

PERSONAL DEVICES
- SONY SMARTWATCH: Sony smartwatch notifications. Displays updates from Facebook, email, calls, texts, and weather. Features weather, calendar, and bell notifications.
- ODORO GLASS: Odor glass. An augmented reality sensor that responds to voice commands, blue light, and gestures.
- SAMSUNG GALAXY GEAR: Samsung Galaxy Gear. Displays notifications for calls, emails, text, and weather, as well as photos. Responds to voice commands and has a Find My Phone feature.
Medical electronics

A shift towards home or patient centric health care: personal healthcare monitoring, diagnostic and preventative medical electronics.

From 91 billion USD in 2011 to 119 billion USD in 2017
Average rate of 4.6% per year (Prismark)
Robotic Market

ROOMBA: as of Feb 2014, over 10 million units have been sold worldwide
AAL INNOVATION SYSTEMS SHOULD BE DEVELOPED IN ORDER TO AVOID THE EARLY DEGENERATION OF COGNITIVE ABILITIES AND DELAY THE OVERCOME OF COGNITIVE IMPAIRMENTS. THESE TOOLS SHOULD STIMULATE THE INTERACTION OF THE USER WITH OTHER PERSONS AND AT THE SAME TIME STIMULATE THE COGNITIVE CAPABILITIES BY MAKING PEOPLE STAY MENTALLY ACTIVE.

**Short**
- Reminder and informer
- Cognitive gaming at community centres
- Cognitive gaming at home
- Remote control by clinicians

**Mid**
- Reasoning tools for the modelling and recognition of cognitive abilities from gaming data
- Personalised gaming applications for the stimulation of cognitive abilities

**Long**
- Advanced interfaces (haptic interfaces, augmented reality), self-learning-modelling of cognitive abilities

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**MANAGEMENT OF CHRONIC DISEASES**

**AAL TECHNOLOGIES COULD SUPPORT OLDER PERSONS IN MANAGE EASILY THEIR CHRONIC DISEASES: SMART INTERFACES AND TOOLS CAN BE USED FOR TELE-CARE AND TELE-HEALTH, SMART DRUG DISPENSER CAN HELP USERS IN TAKING CORRECTLY DRUGS, PORTABLE REHABILITATIVE DEVICES FOR REHABILITATION AT HOME, POINT-OF-CARE AND WEARABLE SENSORS TO MONITOR HEALTH PARAMETERS.**

- **Health monitoring**
- **Taking drugs**
- **Rehabilitation**
- **Remote control by clinicians**

**Short**

**Mid**

Advanced intelligence for self-learning-modelling and prediction of health conditions

**Long**

- In-body (ingestible, implantable) sensors for health monitoring, Body area network
- Standalone point of care, On-body sensors for health and motor monitoring

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AAL TECHNOLOGIES, LIKE IMPERCEPTIBLE ENVIRONMENTAL SENSORS, ADVANCED PROCESSING TOOLS FOR EVENTS RECOGNITION AND PREDICTION, SMART ELECTRONIC APPLIANCES AND ROBOTS, COULD BE ADOPTED IN ORDER TO MAKE HOUSES SAFER AND AGE-FRIENDLY ENVIRONMENTS IN WHICH LIVING

AGE-FRIENDLY AND SAFE ENVIRONMENTS

House safety
House management
Remote control by caregivers

Short
Mid
Long

Assistive robots

Safe data transfer and protection
And Wide area net-work

Multimedia appliances and applications for remote control of the house and of user’s status
KEY ENABLING TECHNOLOGIES (KET)
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KET panorama

- 'SENSING' sensor principles and technologies.
- 'COMMUNICATING' machine to machine interfaces
- 'INTERACTING' human machine interfaces
- 'REASONING' intelligent systems, learning, knowledge
- 'ACTING' automated technology and robotics

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‘SENSING’

new sensing principles and technologies to measure physical, chemical, electrical, optical, etc. quantities of a phenomenon and to produce outputs usable to improve the AAL services.

**Sensing:**
- Smart Sensors
- MEMS
- Lab on Chip
- Biosensors
- Vision Sensors
- Environmental sensors
- Pervasive Sensing & Smart Environments
- In / On Body Sensors
- Quantum Sensors
- Energy harvesting
Sensing

Telehealth

Implantable Sensors

Sensors for personal monitoring

Ingestible Sensors

Telecare

Smart Environment

Environmental Sensors

Wearable Sensors

Sensing

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'REASONING'

Intelligent systems with computational capabilities able to generate knowledge using logical techniques of deduction, induction or other forms of reasoning.

**Reasoning:**
- Context Awareness and Sensor data fusion
- Artificial Intelligence
- Advanced controls for robotics and automation
- Self Dependability and Maintainability
Reasoning

- Expert Systems, Fuzzy logic and rules
- Semantic web and Cloud
- Ontologies
- Statistical and Machine Learning Data
- Emotion/mood
- Autonomous services management and problem optimization
- Collaborative filtering
‘ACTING’
Automated systems and robotics, which proactively act for providing useful services, including physical and cognitive support.

**Acting:**
- Home automation
- Service Robotics
- Smart Mobility
- Smart Actuators
- NeuroRobotics
- Wearable Robotics
- Cloud Robotics
- Social Robotics
“Cloud Robotics: Combination of Cloud Computing and Robotics.
Cloud robotics is not specific to a robot or a type of robot. It is the way robots store information and access a base knowledge.”

(James Kuffner Caneggie Mellon University, @ Humanoids 2010)
A social robot is an autonomous / semi-autonomous robot that interacts and communicates with humans or other autonomous physical agents by means of social behaviors and rules.
“INTERACTING”
All kinds of means, both software and hardware, that allow interaction processes and bridge capabilities between users and service/machines.

**Interacting:**
- Sensorial interfaces
- Spatial Interfaces
- Natural language interfaces
- Multi-modal interfaces
- Neural Interfaces and Brain Computer Interfaces
- Service integrations
- Apps
Neural and multimodal interfaces

EEG-based BCI techniques

Invasive BCIs CI techniques

Noninvasive EEG-based BCIs

Nerve controlled prosthesis

Holograms

Avatars

Haptic Voice Recognition
‘COMMUNICATING’
Technologies related to machine to machine interfacing that allow devices to communicate and cooperate.

Communicating
- BAN/PAN
- LAN/Home network
- WAN
- Standardisation and certification
- Data protection regulations
Grand Tech Challenge

IoT, Cloud market
(Google, Amazon, ...)

Robotics Market
(I-Robot, Panasonic, Honda, ...)

Communication Mobile market
(Telecom, ...)

Consumer Electronics market
(Telecom, ...)

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For real exploitation and deployment, please, don’t forget...

Transversal issues
Transversal Issues

- Ethical, Legal, Social
- Power management, Green technology
- Standardization
- Acceptability
- Dependability
Recommendations (1)

• End-users’ and all stakeholders’ perspective
  – design services
  – evolution of the structure of the society
  – intergenerational relationships
  – ageing starts before 65
• Design criteria
  – acceptability, user-friendliness, accessibility for all, customisability, dependability, etc.
• Experimentation and pilot sites
  – appropriate methodology with standardized metrics and benchmarks that depicts an homogeneous view of the AAL products and services and users’ quality of life
  – necessity of infrastructures and settings
Recommendations (2)

• Dissemination of AAL culture
  – Many elderly persons, caregivers, sociologists and service providers do not know AAL solutions or underestimate potentialities and benefits of ICT devices and new services

• AAL market
  – AAL stakeholders remarked that the AAL market is strongly fragmented (different culture, organisation of services and methods for financing), so necessity to coordinate initiatives to avoid this fragmentation
  – Many interviewed noticed that there is a lack of entrepreneurship among subjects working in AAL research due to market risks (Entrepreneurship and disruptive business models)
Recommendations (3)

• Policies
  – Experts recommended to develop policies, at European, national and also regional level, to rethink the organization of healthcare by renewing socio-medical services and including new innovative services with the use of AAL technologies;
  – Interoperability, standards and certification;
  – Regulation of the transmission, elaboration, sharing and storing of health and personal data;
  – The use of the AAL solutions into society is also invalidated from the lack of adequate infrastructure (e.g. presence of architectural barriers and the lack of adequate WLAN infrastructure in the rural areas).
Recommendations (4)

• Other remarks
  – Every older person should be the main carer of him/herself, so it is important to empower and make senior people aware about how they should take care of themselves.
  – AAL technologies should be facilitator of AAL services for caregivers and so they should not replace the fundamental role of formal and informal caregivers. These tools should be designed to allow clinicians and carers to follow more efficiently older people.
Thank you for your attention

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