



Certified smart and integrated living environments for ageing well

D3.3– Existing R&I initiatives report

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Acronyms and abbreviations

AHA	Active and Healthy Ageing
CA	Consortium Agreement
CoE	Centre of Excellence
DS	Deployment Site
EC	European Commission
EU	European Union
GA	Grant Agreement
IoT	Internet of Things
PC	Project Coordinator
PO	Project Officer
WHO	World Health Organization



Executive Summary

This deliverable is focused on identifying and analysing existing research and innovation (R&I) initiatives and on detecting gaps and shortcomings in overcoming barriers for investments for generating age-friendly building stock (renovation and new buildings, including community integration). The analysis has been made between the partners of the projects for identifying the most significant projects in the European scenario. Furthermore, the analysis has been extended also to National and Regional projects to have a point of view focused on concrete and real scenario and a cross-cultural difference between projects from different countries or areas. The analysed projects came from several research and innovation programmes, e.g. H2020, Active and Assistive Living (AAL), More Years Better Lives Joint programming initiatives, etc. A selection of these projects has been made to provide a list of projects that can identify gaps to be covered from Homes4Life. The project has been divided in 3 major classes:

- Large Scale IoT pilots
- Smart living environments
- Independent Living and Ageing well

For each categories has been analysed several aspects:

- A general description
- Goals
- Strengths and Opportunities
- Weaknesses and Threats

The analysed projects have been chosen in different areas of research, e.g. psychological, social, architectural, urban, ICT to embrace all the main aspects that the certification scheme for age-friendly environment should cover.

1 Introduction

1.1 Aims and objectives

The aim of this report is to investigate existing research and innovation (R&I) initiatives both at European, national and regional level, the overall aim being to identify gaps and shortcomings to overcome barriers in investment in particular with regard to large-scale pilots on Internet of Things (IoT). In addition, opportunities and threats of each project that could be taken into account to develop the certification scheme for age-friendly environments, and to identify avenues for further research, innovation and upscaling activities beyond the Homes4Life project.

1.2 Relations to other activities in the project

This report is in connection with some initiatives of the Homes4Life projects. In particular, the pillars of the Vision document have been used to identify the opportunities and threats of each identified project. Furthermore, for this analysis, maximum use has been made of the knowledge exchange and collaboration structures to be set up as part of the project under WP5 especially in the fields of independent living and ageing well and WP4 with the T4.3 “Validation of the certification scheme”, where the large scale IoT pilots are specifically mentioned.

1.3 Report structure

The report is divided in 3 main sections based on the identified R&I initiatives:

- Large Scale IoT pilots
- Smart living environments
- Independent Living and Ageing well

In this deliverable, the search results in a total of 21 projects that were identified and further analysed. The inclusion criteria for selecting these 21 projects categorised into the three above-mentioned areas are based on:

- The representativeness of the initiative in terms of impact;
- the quality of the available information and results (from e.g. project website, partners involved);
- Recent projects (not before 2010);
- Projects responding to search “ageing well”, “independent living”, “large scale pilot IoT”, “age-friendly environment”, etc.

This information was considered necessary to be able to, individually for each project, identify the gaps and shortcomings in overcoming investments. The gaps and shortcomings are presented here under the subsection entitled “weaknesses and threats”. The positive aspects of each R&I initiative have also been captured separately under the subsection “strengths and opportunities”.

In addition, the partners identified several additional projects than those reported in this report, available at the following links:

<https://cordis.europa.eu/>



<https://www.jp-demographic.eu/calls/projects/>

<http://www.aal-europe.eu/projects/>

However, following further examination, not all of those were included in the final list, as detailed information about the project was not publicly available and so a gap analysis concerning investments, could not be completed.

1.4 Contribution of partners

UNIVPM is the responsible partner for the drawing up of the report. UNIVPM worked on identifying and analysing most impactful research initiatives together with TecNALIA, TNO and ECTP.

2 Large Scale Pilot on Internet of Things

2.1 Activage

Short Title: Activage

Full Title: ACTivage InnoVative IoT smart living environments for AGEing well: Automated driving and infrastructure

Financing programme: Horizon 2020 - EU Research and Innovation programme (2014-2020)

Start Date: 01/01/17

End Date: 30/06/20

Website: www.activageproject.eu

2.1.1 Description

ACTIVAGE is designed as one multi-centric Large-Scale Pilot across Europe. ACTIVAGE has defined a reference architecture for IoT Platform Interoperability. This architecture aims to build general approaches to face the interoperability in a universal way with the objective of serving as common framework to build interoperable smart ACTIVE AGEING solutions that can be deployed, extended and replicated at Deployment Sites across Europe. This architecture aims to build general approaches to face the interoperability in a universal way with the objective of serving as common framework to build interoperable smart ACTIVE AGEING solutions that can be deployed, extended and replicated at Deployment Sites across Europe. Deployment Sites (DS) join clusters of stakeholders in the Active and Healthy Living value network, working together within a geographical space (a city or a region). These clusters or AHA- Business Ecosystems are mainly composed by a cohort of users (older adults, formal and informal caregivers), service providers; health care/social care administration; technological infrastructures and technology providers (infrastructure, sensors, applications, etc.).

2.1.2 Technical Information

A single common interoperable ACTIVAGE IoT Ecosystem Suite (AIOTES) will be built up that provides every DS with the capacity to develop standard and interoperable IoT



ecosystems on top of legacy IoT platforms, or communication and data management infrastructures. GLOCAL Evaluation Framework (Local KPIs and global KPIs) will be designed and implemented to demonstrate and evaluate health & social outcomes and socio-economic impact from local up to a European scale, enabling effective exchange of experiences and cooperation among peers (e.g. users, providers, policy makers). 9 DS rolled out in 7 countries to constitute a major breakthrough to sustain open innovation in AHA field.

2.1.3 Goals

- Promote IoT-based products for health and social care in developing countries, thereby making global health and social care systems more sustainable with a wider audience.
- Create IoT-based smart living environments across the globe for senior citizens who are not residing with their families.
- Create business opportunities for niche solutions on IoT-based products for the elderly, in keeping with the increasing demand.
- Improve the overall quality of life of senior citizens across the globe and give them independence with no financial burdens.

2.1.4 Strengths and Opportunities

- Empowering senior citizens to live independently
- Improves quality of life.
- Building interoperable local IoT ecosystem and improve communication between the different heterogenous layers. Semantic Interoperability Layer (SIL) implementation.
- Covers major aspects of ethics and rights of Users.
- Presents an ideal IoT framework for the deployment of more IoT-based wearables and other innovative solutions to cater to a growing market.
- Could be used to create an evaluation framework to be emulated worldwide.

2.1.5 Weaknesses and Threats

- IoT wearables and other devices are prone to threats and therefore regular upkeep would be required to ensure that the required level of security is maintained and is regulated by a credible authority.
- Project involves no cities outside Europe.
- Older people may have limited knowledge and understanding of technologies and could be averse to using new IoT technologies later in life.

2.2 CREATE-IoT

Short Title: CREATE-IoT

Full Title: Cross fErtilisation through AlignmenT, synchronisation and Exchange for IoT: Stimulate collaboration between IoT initiatives, by supporting the development and growth of IoT ecosystems based on open technologies and platform

Financing programme: Horizon 2020 – The EU Research and Innovation programme (2014-2020)

Start Date: 01/01/17



End Date: 31/12/19

Website: <https://european-iot-pilots.eu/create-iot/>

2.2.1 Description

CREATE-IoT brings together 19 partners from 9 European countries. The objectives of the project are to stimulate collaboration between IoT initiatives, foster the take up of IoT in Europe and support the development and growth of IoT ecosystems based on open technologies and platforms. This requires synchronisation and alignment on strategic and operational terms through frequent, multi-directional exchanges between the various activities under the IoT Focus Areas.

2.2.2 Goals

- Validation of technological choices, sustainability and replicability, architectures, standards, interoperability properties and key characteristics such as security and privacy.
- Exploration and validation of new industry and business processes and innovative business models validated in the context of the pilots.
- User acceptance validation addressing privacy, security, vulnerability, liability and identification of user needs, concerns and expectations for the IoT solutions.
- Significant and measurable contribution to standards or pre-normative activities in the pilots' areas of action via the implementation of open platforms.
- Improvement of citizens' quality of life, in the public and private spheres, in terms of autonomy, convenience and comfort, participatory approaches, health, lifestyle and access to services.
- Creation of opportunities for entrepreneurs by promoting new market openings, providing access to valuable datasets and direct interactions with users, expanding local businesses to European scale.
- Development of secure and sustainable European IoT ecosystems and contribution to viable IoT infrastructures beyond the pilot lifetime.
- Ensure efficient and innovative IoT take-up in Europe, building on the various parts of the initiative (pilots, research, horizontal actions).
- Efficient information sharing across the programme stakeholders for horizontal issues of common interests.
- Extension and consolidation of the EU IoT community, including startups and SMEs.
- Validation of technologies' deployment and replicability towards operational deployment.
- Validation, in usage context of most promising standards and gap identification.
- Strengthening of the role of EU on the global IoT scene, in particular in terms of access to foreign markets.

2.2.3 Strengths and Opportunities

- Definition of KPI's for design, testing, validating and measuring Large Scale Pilots' impacts.
- Definition of KPI's specifically designed to meet the needs of smart living environments for ageing well.

- Ensuring coherent exchanges between the various activities of the Focus Area, and cross fertilisation of the various pilots for technological and validation issues of common interest across the various use cases.
- Supporting and assessing the current IoT Large-Scale Pilot projects, sharing best practices and aligning horizontal issues.
- Developing a more inclusive ecosystem where innovation, art and creativity take active part on it.
- Proposing a framework for the coherent integration of the EU IoT value chain, strengthening the links between different on-going initiatives in the IoT domain.
- Fostering interoperability of existing and future IoT solutions.
- Implementing and developing a policy framework in the IoT domain addressing the current horizontal issues that prevent the from massive deployment of IoT solutions, with a special focus on the trust and legal domains.

2.2.4 Weaknesses and Threats

- the project is only focalised on technologies and not on the user's needs.
- The project considers only standards for IoT.
- The project considers only the European situation without taking into account standards and situations of EU different countries.

2.3 INNOITEAM

Short Title: INNOITEAM

Full Title: Centre of Excellence (CoE) in IT Science and Technology for the Internet of Things and Smart Living Systems.

Financing programme: Horizon 2020 – The EU Research and Innovation programme (2014-2020)

Start Date: 01/09/17

End Date: 31/08/18

Website: <https://european-iot-pilots.eu/create-iot/>

2.3.1 Description

The overall objective of the project is to create a new Centre of Excellence (CoE) in IT Science and Technology for the Internet of Things and Smart Living Systems, which will be referred to as "InnoITeam".

2.3.2 Goals

- Implementing and distributing scientific knowledge in the IoT field by providing international and interdisciplinary leadership in the Baltic sea region
- Creating and transferring advanced knowledge, technology and integrated solutions in IoT related ICT areas
- Fostering talents of a new generation of innovation-oriented researchers and professionals
- Promoting further enactment and involvement in IT sector for those in common business and households

2.3.3 Strengths and Opportunities

- to become the leading provider of innovative technologies for IoT and Big Data for the improvement of the growing technological personal and industry needs in Europe;
- to consolidate research and development, education and training, and networking and promotion resources activities in ICT;
- to coordinate, integrate and support research excellence and innovation development in Lithuania, the Baltic Sea region, and Europe;
- to support researchers, academics, industry partners and entrepreneurs in the field of ICT, particularly in the IoT, to produce innovations beneficial for the society and economy of Lithuania and beyond.

2.3.4 Weaknesses and Threats

- Just focalized in the Baltic sea region.
- This project considers just standard for IoT but not standard for age-friendly environment.
- The interaction between the user and technologies/environment is not consider.

2.4 i-evaalution

Short Title: i-evaalution

Full Title: Integrating and evaluating AAL-solutions.

Financing programme: AAL Programme

Start Date: 01/04/18

End Date: 30/09/20

Website: <https://www.i-evaalution.eu>

2.4.1 Description

The aim of i-evaalution is to give access to innovative Active and Assisted Living solutions in a large scale pilot test. It combines AAL solutions with modern consumer products. The goal is to find evidence on the effect of such solutions on the quality of life of older adults and the socio-economic viability in a greater context.

2.4.2 Goals

- Analysing the impact on the end-users' quality of life the possibility to integrate them into existing processes and their potential to contribute to a secure and independent living in an ageing society
- Supporting elderly persons in core areas of daily life to live autonomously and socially integrated
- Combining AAL products and consumer products such as Smart Home and devices like cloud-based voice services
- Establishing relevant services and distributing knowledge on how to successfully integrate useful, IT-based support for elderly persons' daily living

2.4.3 Strengths and Opportunities

- Realize a standard AAL bundle evaluating and checking the interoperability of certain AAL and other smart ICT products.
- Socio-economic aspects are considered.

2.4.4 Weaknesses and Threats

- The physical environment is not mentioned.
- The user acceptance for the technologies is not considered.
- In the project the IoT standard are not mentioned.

2.5 KomZET SHL

Short Title: KomZET SHL

Full Title: Kompetenzzentrum Markt- und Geschäftsprozesse Smart Home & Living Baden-Württemberg

Financing programme: Regional initiative (Baden-Württemberg)

Start Date: 01/08/19

End Date:

Website: <https://www.digital-bw.de/strategie-und-projekte>

2.5.1 Description

In the frame of the digitalisation of the Land (Baden-Württemberg region), the "Competence centre for Smart Home & Living BW" will be built in order to develop the potential of Smart Home and Living applications.

2.5.2 Goals

- Structure an efficient source of information in order to make possible the development of intelligent and connected houses of the future.
- Using the digitalisation as a way for people to live longer at home autonomously.
- related to energy efficiency aspects

2.5.3 Strengths and Opportunities

- Using smart devices to improve the energy aspects of the environment.
- The smart solutions for the home environment can improve the indoor comfort for the user.
- establishing information, especially for the crafts, so that the intelligent and networked house of the future becomes more and more a reality.

2.5.4 Weaknesses and Threats

- Standards for age-friendly environment are not mentioned.
- the project is also focused on energy efficiency aspects but the Smart Readiness Indicator is not mentioned.
- the interaction between the user and the environment is not mentioned in the project website.



3 Smart Living Environments

3.1 SMARTWORK

Short Title: SMARTWORK

Full Title: Smart Age-friendly Living and Working Environment.

Financing programme: EU European Commission Research and Innovation programme Horizon 2020

Start Date: 01/01/19

End Date: 31/12/21

Website: <http://www.smartworkproject.eu/>

3.1.1 Description

SmartWork is supporting active and healthy ageing at work for older office workers, through a suite of smart services, building a Worker-Centric AI System for work ability sustainability.

3.1.2 Goals

- Offers a suite of smart services to support active and healthy ageing for older office workers using Artificial Intelligence.
- Monitors workers' health, behaviour, cognitive and emotional status, and responds to their needs.
- Support workers staying longer and happier in their job by tackling the consequences of ageing, sedentarism and physical and mental health problems.
- Delivers benefits for older workers, their employers and carers and has a wider positive impact on society and community wellbeing.
- Actively engages end-users (55-65 aged office workers, employers and carers) in real-world settings at pilot sites in Coimbra (Portugal) and Aarhus (Denmark) to co-create and evaluate the SmartWork system.

3.1.3 Strengths and Opportunities

- Improving the well-being of workers with AI in work and home environment.
- Developing services to improve the life-quality of older workers.
- The project takes in consideration 3 different kind of workers: office workers, employers and formal/informal carers.

3.1.4 Weaknesses and Threats

- The standards for age-friendly environment are not considered.
- the project is focused in technology installed in the environment but the physical environment is not consider as an aspect to improve the quality of life of users.

3.2 AIDA

Short Title: AIDA

Full Title: AIDA



Financing programme: ERC (European Research Council) Starting Grant (FP7/2007-2013)

Start Date:

End Date:

Website: <https://architectuur.kuleuven.be/>

3.2.1 Description

AIDA is an interdisciplinary research project that aims to investigate whether and how the spatial experience of people living with a disability can trigger innovation in architecture, by expanding the way in which architects understand and conceive space.

3.2.2 Goals

Working with end-user to define the right environment for people with disabilities (blindness, visual impairment, autism, Alzheimer's dementia, etc) the research project aimed to develop a more profound understanding of how inclusive design can be realised in architectural practice.

3.2.3 Strengths and Opportunities

- to develop the right environment for the target users the project focalized the attention on the interaction between people with disabilities and space.
- Multisensorial spatial experience of people with disabilities was analysed to design spaces.
- Defining an innovative design concepts was expected to give a powerful impulse to quality improvement of the built environment
- Target users was involved in the design of the space also related to the choice of materials and colours (walls and floors), rooms' dimensions and spatial organization.

Coomans, K., Vermeersch, P., Heylighen, A. (2016). How do older residents experience a recently built innovative housing and care facility?. In: Langdon P. (Eds.), *Designing around people*. London: Springer-Verlag.

Van Steenwinkel, I., Verstraeten, E., Heylighen, A. (2016). Adjusting an older residential care facility to contemporary dementia care visions. In: Langdon P. (Eds.), *Designing around people*. London: Springer-Verlag (accepted).

3.2.4 Weaknesses and Threats

- To design the space wasn't considered standards for built environment.
- Technologies aren't included in the study
- The project is focused in a specific geographical area, Flanders

3.3 AFE-INNOVNET

Short Title: AFE-INNOVNET

Full Title: Towards and AGE-FRIENDLY Europe

Financing programme: ICT Policy Support Programme (ICT PSP)

Public



Start Date: February 2014

End Date: January 2016

Website: <http://www.afeinnovnet.eu/>

3.3.1 Description

AFE-INNOVNET aims at mobilising a EU-wide community of local and regional authorities and other stakeholders to support the scaling-up of innovative solutions for age-friendly environments to support active and healthy ageing across Europe.

3.3.2 Goals

- mobilise a wide range of local and regional authorities and other stakeholders to link up, benefit from each other's experience and work together to promote initiatives on age-friendly environments across the EU;
- develop methodologies to help local and regional authorities assess the socioeconomic impact of age-friendly environments and the benefits of involving older people in the co-production of age-friendly environments solutions;
- develop a repository of notable and replicable practices in innovative ICT and services solutions with associated socio-economic evidence;
- facilitate pilot projects clustering to stimulate local/regional investment in ICT and services innovation and thus local/regional economic activity (with a focus on SMEs);
- facilitate public access to research/expertise and generic methodologies in the field of age-friendly environments;
- ensure convergence and strong coordination with WHO Age-Friendly Cities and Healthy Cities initiatives;
- facilitate information sharing between all interested stakeholders in the field of age-friendly environments;
- launch an EU Covenant on Demographic Change to create the necessary political and technical framework to bring together in a more formal and long-term structure local and regional authorities – and other stakeholders - across the EU who want to cooperate and implement smart and innovative evidence based solutions. The proposed Covenant will be inspired by the existing Covenant on sustainable energy.

3.3.3 Strengths and Opportunities

- Involvement of a broad group of stakeholders from all parts of the EU, including regions and MSS that are not normally well-connected to innovation in healthy ageing, e.g. project partners from Romania
- Strong focus on grass-roots initiatives and learning from practice.
- Approach shaped by the WHO AFC and WHO AFEE frameworks assures a broad, holistic, multi-faceted view of the concept of age-friendliness
- Emphasis on sharing of experience and peer-to-peer learning
- Particular focus on transferability of good practices across contexts (cultural, national, system), supported by easy-to-understand descriptive framework and good practices repository
- Strong emancipatory drive and focus on end-user involvement and empowerment and the use of participatory design and realisation strategies
- Network and knowledge base established consolidated in the Covenant on Demographic Change – Towards an Age-Friendly Europe

- Development of an impact assessment tool (the SEE-IT tool), based on WHO and Active Ageing Index approaches, aimed at practical use by non-experts in local and regional implementation contexts

3.3.4 Weaknesses and Threats

- Not a research project. AFE-INNOVNET was a Thematic Network focused on bringing together stakeholders and exchanging knowledge and insight on current practice
- While some projects included in the AFE-INNOVNET repository address homes and housing, definition of age-friendly environment has been much broader, and the project focus has been primarily on neighbourhood, and urban and rural area effects and on the impact of age-friendly environment initiatives on community-level indicators
- While addressing and involving a wide spectrum of stakeholders, the perspectives, priorities and concerns addressed by the project have been mainly those of local (and sometimes regional) public authorities. While this has been a practical outcome of the project, rather than a predetermined limitation, it does mean that not all perspectives relevant for Homes4Life are well-covered.
- Small scale project. Financial sustainability of the Covenant on Demographic Change has proved challenging.

3.4 NANA project

Short Title: NANA project

Full Title: a new architecture for the new aged that advocates a better built environment for older people

Financing programme: ICT Policy Support Programme (ICT PSP)

Start Date: 2015

End Date: N/A

Website: <http://www.architects.nsw.gov.au/download/BHTS/2015-BHTS-NANA-Project-FINAL-lo-res.pdf>

3.4.1 Description

In search of new approaches to aged care, the NANA project studied 13 residential developments in Portugal, Spain, Switzerland, Germany, Denmark and Netherlands. The aim of this project is to explore how architects can design better environments for older people that improve their enjoyment of life. It starts with rethinking some of our design language.

3.4.2 Goals

- The project proposes three objectives: Happiness, Normality and Equality.
- The project proposes 8 features: Windows to the world, space grace, the great outdoors, small is beautiful, freedom to choose, belonging, integration and something to do.

3.4.3 Strengths and Opportunities

- Studying the effect of the architecture on the residents.

- Analysing human need and analysing the buildings in terms of how they met identified needs (comfort, accessibility, physical wellbeing, etc.).
- In terms of ageing, the ergonomics and comfort factors of space are analysed but also safety and security aspects.
- Privacy aspects are considered
- Usability and Accessibility are considered, ramps, stairs, common bathroom, rounded corners/curved plans, door handles/hardware, etc
- Simple technology is used to improve the accessibility, e.g. use of colours

3.4.4 Weaknesses and Threats

- Standards for age-friendly environment aren't considered in this project
- Technology for smart home is not included in the environment.

3.5 Euskadi Lagunkoia

Short Title: Euskadi Lagunkoia

Full Title: Euskadi Langunkpia

Financing programme: Department of Employment and Social Policies of the Basque Government

Start Date: 2016

End Date: ongoing

Website: <http://www.architects.nsw.gov.au/download/BHTS/2015-BHTS-NANA-Project-FINAL-lo-res.pdf>

3.5.1 Description

The Euskadi Langunkoia project is based on the "Age-friendly Environments Programme" promoted by the WHO, its objective it on encourage participation by the elderly, and citizens in general, in order to improve neighbourhoods and environments in the municipalities of the Basque Country so that we can continue with our lives as we age.

3.5.2 Goals

- The WHO initiatives is adapted to Euskadi.
- Take advantage of the potential that older people represent in the life of the towns and cities of Euskadi as generators of well-being.
- Create and encourage community participation processes.
- Create a network of friendly initiatives in Euskadi.
- Facilitate the introduction of changes in the environments in order to improve the quality of life of its citizens

3.5.3 Strengths and Opportunities

- This plan has adapted the methodology for the WHO according to the socio-political reality of Basque Country and to the idiosyncrasy and social model of each of its towns and cities.
- The project consists of different initiatives around the friendly cities that are implemented in towns around Basque Country. The project is tested in real pilots.
- The project is presented as a general strategy, but the initiatives are local, and of a smaller scale, allowing them to be implemented.



- As the methodology of the WHO it works in eight different domains transport, housing, participation, respect and inclusion, citizen participation and employment, communication and information, social and health services, outdoor spaces and buildings, and the initiatives have different approaches that work in all those domains.

3.5.4 Weaknesses and Threats

- Some of the initiatives remain too local, with the danger of the lack of replication.
- The initiatives are launched mostly by the local administrations or social institutions, therefore the initiatives cover the social dimension but sometimes have the lack of the technological dimension.
- The use of Technology is not considered to improve the environments.

3.6 Home Sweet Home

Short Title: Home Sweet Home

Full Title: Health monitoring and social integration environment for supporting wide extension of independent life at home

Financing programme: Information and Communication Technologies Policy Support Programme - CIP PSP

Start Date: 01/01/2010

End Date: 31/12/2012

Website: no more available

3.6.1 Description

The HOME SWEET HOME project trialled a new, economically sustainable comprehensive set of home assistance services for independent living. The Pilot sites (210 users of whom 105 in the Intervention Group) was made in Belgium (City of Antwerp, 60 users), Catalonia (Town of Badalona, 30 users), Ireland (North Eastern Region, 60 users) and Italy (Town of Latina, 60 users). The HOME SWEET HOME service is based on various subsystems which have been merged into a single, comprehensive, senior-friendly service.

3.6.2 Goals

- Improving the quality of life of older people by extending their independent life (if they so wish), even if they live alone, while providing a level of safety equivalent or better than that enjoyed in elderly homes.
- Improving the quality of life of caregivers and relatives by offering both respite from the care routine and peace of mind when they are away, knowing that their dears are properly looked after.
- Improving the social connection of elderly people confined inside the four walls of their flat or house by allowing them to stay in touch visually with their loved ones and the Contact Centre

- Compensating for growing physical impairments by easy-to-use domotic devices which make it possible to literally “manage the house from an armchair” if elderly people are no more able to move around.
- Demonstrating a more efficient business model for care provision which reduces the cost of social and health care to elderly people, through better targeting of interventions, early detection of situation of risk and deterioration of mental conditions and closer collaboration among organisations providing care to elderly people.
- Exploring alternative work flows which compensate for the ever growing shortage of formal caregivers and homecare personnel through the deployment of affordable, reliable and user-friendly technology.
- Demonstrating that the same technology for AAL can be deployed successfully in different health and social services set-ups.

3.6.3 Strengths and Opportunities

- The impact of the HOME SWEET HOME system was measured by comparing a number of indicators for those receiving the HOME SWEET HOME service (the Study Group) and those of another group of elders (the Control Group) over a 27-month Randomised Controlled Trial.
- The conclusion arising from the project is that the openness to learn and adopt new things is essential in the process of introducing new technologies to an older person's home. The pure expectation of health and social benefits often is not a sufficient motivation to accept ICT, unlike what some may think. Even if future generations will be more technology-literate, there will always be ‘tech freaks’ ready to try anything new and people who have difficulties or do not want to adapt to new media and devices.
- The project confirmed the need to tailor the solutions to the specific needs, expectations, lifestyle, preferences and routines of the individual in order to avoid duplication and ensure that the offered services are used by the consumer. It would therefore be safe to conclude that the study builds a strong case for a personalised set of services.
- The study confirmed that implementing technologies has to be accompanied by social services, ongoing training, and long-term technical support.
- The study reveals that cost remains one of the most important reasons of the divide.

3.6.4 Weaknesses and Threats

- the project is focused on technologies for smart homes and it didn't consider the physical environment in the scheme to improve the life-quality of older people at home.
- Standards aren't mentioned in the project.
- Some weaknesses derives from the fact that this project is quite old. It finished in 2012.

4 Independent Living and Ageing well

4.1 ICT4SILVER

Short Title: ICT4SILVER

Full Title: Digital technologies to address silver economy needs



Financing programme: ICT Policy Support Programme (ICT PSP)

Start Date: 01/07/2016

End Date: 31/12/2018

Website: <https://www.ict4silver.eu/>

4.1.1 Description

ICT4SILVER project crossed the needs expressed in 5 main fields of application of the Silver Economy (Health and Social needs, the autonomy of people and home care; Housing and Urban Development; transportation and mobility; prevention of aging) with the potential innovation provided by ICT technologies (sensors and software solutions, large volumes of data, Internet of things, ...). On this basis, ICT4SILVER proposed to accompany thirty 15 SMEs in 5 SUDOE regions to help accelerate the commercialization of innovative products / services that integrate ICT in the applications designed to prolong the autonomy of the elderly (mobility aid, remote control, ...), especially in a transnational context. The chosen methodology was the 'living lab' concept, with the project offering to selected SMEs the possibility to test their products/services directly with relevant end-users (ageing persons, formal and unformal care-givers, health professionals, social services, etc.) within the context of the three living labs (one in each country) included in the partnership, and with further support services from the partners.

ICT4SILVER project aimed at increasing the level of awareness and maturity of the markets for ICT-based solutions for ambient assisted living and ageing populations, and to develop the foundations of a meta-cluster of companies active in this market, transversal to the 3 participating countries.

4.1.2 Goals

The main goals of the project include:

- Identify SMEs interested in the Silver Economy with potential products to be applied to this sector.
- To test in living labs with real users the products selected to get user feed-back related to the product utility.
- To give recommendations to SMEs related to the improvements to implement in the products to get Silver Economy market with a success option.
- To define a methodology of pilot procedures, to be used in the future.
- To identify the conditions to define a European Meta Cluster related to the Silver Economy.

4.1.3 Strengths and Opportunities

ICT4SILVER has achieved very relevant results, in all 3 main axes addressed by the project, but especially in the first 2:

- Improving framework conditions for the development of ICT-based solutions for the Silver Economy:

Results at this level have mostly been felt at regional level, with the project contributing to the recognition of the Silver Economy as a relevant sector of activity (independent from health) in all three main regions addressed by the project (Aquitaine-Limousin-Poitou/Charentes in France, Euskadi in Spain and Norte/Centro in Portugal) and further reinforcing the links between its main intervenient, namely company's clusters, care providers, technology providers and policy-makers (through development agencies). The project has increased the awareness of both firms and policy makers for the economic potential of the sector and launched the basis for an improvement of regional support policies in these areas. It has also increased the awareness of end users aspects, providers for the opportunities and challenges brought by recent ICT developments, and ultimately contributed to a more mature and evolved sector, as a whole and across the whole of the SUDOE region.

- Support the demonstration of innovative products and services through living labs. One of the highlights of the project was the evaluation of the implemented solutions by SMEs selected in experimental environments, in direct contact with users' recipients (elderly people and health professionals, caregivers, health and social services), and within the Living-Labs of the ICT4SILVER network.

While not all demonstration tests have been successful – and some have quite simply failed to reach end-users – they have all contributed to highlight either positive or negative features of the products and their level of maturity regarding market launch, in particular at international level. In this sense the project has definitely contributed towards SME innovation and technology transfer, allowing to better know the qualities and flaws of their solutions, and better develop innovation road maps and market strategies.

In addition to these, other potential high-impact results have been achieved:

- All partners have improved their knowledge of the silver economy as an emerging sector and are now in a better position to contribute to the development of the sector in their regions;
- For some partners – e.g. IPCA – this was also the first relevant international project, increasing the experience and expertise of the organisation and their potential impact as a knowledge centre in the region;
- Transnational links of actors active in the ICT field in general and Silver Economy in particular have been reinforced, which can generate further initiatives and more and better support to SMEs across the SUDOE region;
- Overall, the concept of a “ageing accelerator” has been proven and can now benefit from more attention and support from regional policy makers;

4.1.4 Weaknesses and Threats

- Lack of maturity of the markets, and especially of the smaller firms targeted by the consortium, as well as difficulties (technical, legal, logistical) in testing the product abroad, and also some heterogeneity between the involved living labs.

- High difficulty to involve companies, SMEs mainly, in the evaluation of products for Silver Economy application. It is difficult to involve SMEs in pilots to test Silver Economy products without an economical support, ought to high cost to be supported by the companies (mainly Start-ups).
- The approved workplan reflected an “ideal” situation, where SMEs are willing and ready to start testing their products in the living labs facilitated by the project. However, implementation has shown that this is far from being the case and that a preliminary ‘technological diagnosis’ of the solutions is needed in order to optimize the tests.
- The problems revealed by the partners regarding the definition of the living labs tests also showed that this aspect had been overregarded in the proposal and that it is still difficult to adopt common procedures across different regions and especially different types of organisations. This lack of definition also impacted negatively the level of participation in the call and as a lesson for the future it is important to clearly define protocols – which may vary from region to region or from organisation to organisation – before ‘marketing’ these services to SMEs.
- There is no standard on ageing policies between European countries, with the additional difficulty to introduce new products in the European market and it is critical to get a “lobby” structure to press politicians to improve the European policies related to Silver Economy.

4.2 Progressive

Short Title: Progressive

Full Title: Progressive Standards around ICT for Active and Healthy Ageing

Financing programme: Horizon 2020 – The EU Research and Innovation programme (2014-2020)

Start Date: 01/10/2016

End Date: 31/01/2019

Website: <https://progressivestandards.org/>

4.2.1 Description

The PROGRESSIVE project also known under the full title: ‘Progressive Standards around ICT (Information and Communication Technologies) for AHA’, was a two-year Coordinated and Support Action (CSA) financed by the Horizon2020 programme of the European Commission. It was implemented by a consortium of ten partners, led by De Montfort University (United Kingdom). It focused on ICT standards for active and health ageing with a view to infuse an age-friendly approach to the world of ICT standards.

4.2.2 Goals

The PROGRESSIVE project aimed to provide a dynamic and sustainable framework for standards and standardisation around ICT for active and healthy ageing (AHA). By developing 9 tenets underpinning the development of standards, it intended to initiate a change in mindsets when it comes to the ethics support of ICT-related standards for active

and healthy ageing. In a context of an ageing population where older adults comprise nearly a fifth of our population, the project worked to increase older people's engagement and inclusion in standardisation process (in a co-creation approach) as well as offer new ways of thinking to improve the impact and influence of standards.

4.2.3 Strengths and Opportunities

Per the words of PROGRESSIVE itself, "the project called for explicit acknowledgement that older people have ICT knowledge, skills and interest and so must be involved in the standardisation process." From this observation onwards, the project delivered:

- a platform for discussion and debate among a broad range of stakeholders from policy makers to standards bodies (internationally and nationally), crucially facilitating the engagement of older people. It takes the form of a STAIR-AHA Platform (standing for STAndardisation, Innovation, and Research for Active and Healthy Ageing).
- a set of nine ethical tenets working as a framework to help identify and nurture good practice in the world of ICT standardisation for active and healthy ageing: <https://progressivestandards.org/ethical-framework/>. This ethical framework was for instance used in the guidelines for ICT standards used in the context of age-friendly smart homes.
- new benchmarks for good practice when it comes to standards for ICT and AHA, leading to the development of a good practice standard database in eight key areas related to the field of ICT for AHA (incl. one on 'Built Environment' and one on 'Housing and Care Facilities').
- a set of guidelines including: guidelines for the co-production of standards, procurement tips for age-friendly communities, and the aforementioned guidelines for standards around ICT for AHA in the context of age-friendly smart homes.

4.2.4 Weaknesses and Threats

The current main threat posed to the PROGRESSIVE project is the sustainability of the newly established STAIR-AHA platform that has been established within the frame of the two European standardisation bodies CEN and CENELEC for a duration of two years but without dedicated funding. The participation and involvement of stakeholders thus depend on their own resources.

4.3 IBH LIVING LAB

Short Title: IBH LIVING LAB

Full Title: IBH LIVING LAB

Financing programme: Interreg V-Programms „Alpenrhein-Bodensee-Hochrhein“ (Germany, Switzerland, Austria)

Start Date: 01/11/2016

End Date: 30/11/2020

Website: <http://www.living-lab-aal.info/ibh-living-lab/>

4.3.1 Description

AAL can be described as "assistance systems for a self-determined life". It covers different concepts, methods, information- and communication technologies as well as services that make the daily life of people with need for support easier and also should make it possible to live a self-determined life. The services of professional and informal carers shall be supported and facilitated by AAL technologies. The product and service palette in the AAL-sector is broad, and they can be chosen according to individual needs. Fields of application are for example:

- Health, nutrition and disease management (e.g. monitoring of vital data, reminder for medication intake)
- Safety (e.g. emergency buttons, fall recognition, fire alarm system, burglar alarm, automatic switch-off for the stove in case of absence)
- Messaging system for defined incidents (e.g. motionlessness in the flat)
- Increase of comfort and lifestyle (e.g. house automation systems through a context-sensitive lightning- temperature- and blind control; operation of lamps, the heating system, blinds or electrical appliances through the smartphone)
- Communication and integration into the social environment (e.g. senior friendly tablets with Skype and photo albums)
- Mobility (e.g. watches with tracking systems, simplified timetable enquiries of public transports)
- Support for dementia patients (e.g. light guiding systems, calendar functions with reminders, memory training apps)

4.3.2 Goals

The project goal is to make the public aware of AAL and to build structures that make it easy to use AAL at home and in care and support facilities. The project tests various AAL products in the real environment (in the Living Lab) tested by the target group and taken into account feedback and experience in the further development.

4.3.3 Strengths and Opportunities

- Provides good examples of situations older people might face at home, and how technologies can overcome difficulties
- The project considers technical surroundings and the psycho-physiological aspects, cultural
- Establishes a living lab environment with partners from research, social welfare and SMEs
- The project is opened to the testing of new solutions for private consumers, services and technology providers

4.3.4 Weaknesses and Threats

- The project lasts since 2016. But no publication about the progress is available yet.
- The certification and standard for age-friendly environment are not considered
- The project is designed within the specific region of the Bodensee region (South Germany, Northern Switzerland, Eastern Austria). There might be difficulties in applying it to other regional contexts (culture, local specialised SMEs and research centres, etc.).



4.4 Health@Home

Short Title: H@H

Full Title: Health@Home: Smart communities for citizen's wellbeing

Financing programme: MIUR (Italy)

Start Date: 01/01/2015

End Date: 31/12/2019

Website: n.a. UNIVPM is a partner of this project, so, all the results are available to complete this session.

4.4.1 Description

The project is realized thanks to the cooperation among ICT health oriented community, the Home Automation community connected by the main Italian telecommunication company. This is the first case of a structured national cooperation which faces these topics. The main purpose is to create Smart Communities dedicated to the wellbeing of the citizen. In particular, the coordinated application of home automation / appliance and telecommunication systems specifically to the clinical sciences will permit to create perspectives unconceivable until recently. This innovative organic implementation of that technologies could supply a great contribution to the increase of effectiveness, efficiency and the right to access, with equals opportunities, to an adequate health care standard service.

4.4.2 Goals

The aim is to create a network of assistance towards the citizen based on a network of integrated health and social services based on interoperable devices / systems.

4.4.3 Strengths and Opportunities

- Providing services for older users (social and care services)
- Improving wellbeing and the independence of the older user at home
- Create a billing system
- Developing an interoperable cloud infrastructure aimed at linking the companies and organizations providing services with the end-users
- Testing ICT technologies in real scenarios to collect information based on the user and environment.

4.4.4 Weaknesses and Threats

- The interaction between the user and the environment are not considered.
- The infrastructure considered standards for the definition, application, monitoring and evaluation of clinical/health workflow but just for the ICT point of view and in National scale.

4.5 eWare

Short Title: eWare



Full Title: Early Warning (by lifestyle monitoring) Accompanies Robotics Excellence

Financing programme: AAL programme

Start Date: 01/06/2017

End Date: 31/05/2020

Website: www.aal-eware.eu

4.5.1 Description

eWare “Early Warning (by lifestyle monitoring) Accompanies Robotics Excellence” introduces a novel eco-system to support the wellbeing of people with dementia and their informal carers. Lifestyle monitoring can reduce caregiver's distress and thereby extend the period that the informal caregiver can sustain the care and support needs for the person with dementia with affective return in terms of patient life quality and social costs. The technology and services used in eWare consist of existing lifestyle monitoring or life pattern monitoring connected and integrated with novel support social robots.

4.5.2 Goals

eWare aims to develop a useful and meaningful service in co-design with human beings. The main project goals of eWare are focused on outcomes:

- reduce subjective stress of the informal carers and the patient community,
- enhance quality of life of the informal carer and person with dementia,
- support communication and information between formal and informal carers.

4.5.3 Strengths and Opportunities

- Empowering senior citizens to live independently
- Improves quality of life
- Co-design to evaluate the user needs and acceptability
- Alpha pilots to define the problems in the system and improve it before to start with the real pilot
- Interaction between the older user and the robot
- Decreasing caregivers' burden
- Beta pilots tested on 300 end-users (people with dementia, caregivers)
- The main aspect of the system is the setting of the goals for people with dementia. Goals are the combination of ADL events (sensor events of the life-style monitoring system) and reminder messages from the social robot
- Privacy issues are considered
- Business model

4.5.4 Weaknesses and Threats

- From now, the eWare eco-system is not an open platform.
- The physical environment is not considered.

4.6 RESILIEN-T

Short Title: RESILIEN-T

Full Title: Assistive sensor-based technology driven self-management for building resilience among people with early stage cognitive impairment

Public



Financing programme: AAL programme

Start Date: 01/03/2019

End Date: 28/02/2022

Website: <https://resilien-t.eu/>

4.6.1 Description

RESILIEN-T aims to deploy in the market an innovative modular ICT solution for self-management of Cognitive Impairment, to reinforce the self-monitoring ability of people with a diagnosis, with the aim of slowing the progression of the disease.

4.6.2 Goals

- To develop an open, modular, adaptable platform to provide self-management and coaching services to People with Cognitive Impairment, integrating informal and professional caregivers as necessary;
- To develop evidence-based applications (apps) to support self-management by PwCI, covering the areas of nutrition, physical social and cognitive activities;
- To field test the new integrated ICT solution over 12 months with 150 PwCI and 150 caregivers in Italy, Netherlands, Canada and Switzerland;

4.6.3 Strengths and Opportunities

- Co-design to evaluate the user needs and acceptability
- Defining new services for the older users based on improve the social interaction, the quality of life, etc
- The platform is open and interoperable

4.6.4 Weaknesses and Threats

- From the co-design session can emerge a cross-cultural differences between countries.
- The physical environment is not considered.

5 Conclusions

Following the analysis of each identified research and innovation initiative considered relevant for Homes4Life, targeted specifically for the European market, a general analysis of how Homes4Life is integrated on this framework is made further below. The analysed projects were selected by the H4L partners (UNIVPM, TECNALIA, ECTP and TNO) according to the following 3 main categories and included European, national and regional initiatives:

- Large Scale IoT Pilots
- Smart living environments
- Independent Living and Ageing well

The analysis identified opportunities and weaknesses for each project. Homes4Life has to take into account the opportunities coming from these projects and avoid the emerged barriers to develop a certification Scheme for age-friendly environments. For the analysis, public deliverables, websites, open access publications have been considered. The online material usually shows the good opportunities of the projects and in some minor cases the weaknesses.

5.1 General Analysis

In order to perform a general analysis in terms of the dimensions relevant for H4L, a different classification has been done, see the Venn Diagram, Figure 1. In this case the individual R&I projects are classified according to 3 areas grouped according to the central themes of H4L:

- Physical environment;
- Technology;
- Health and social aspects for ageing people

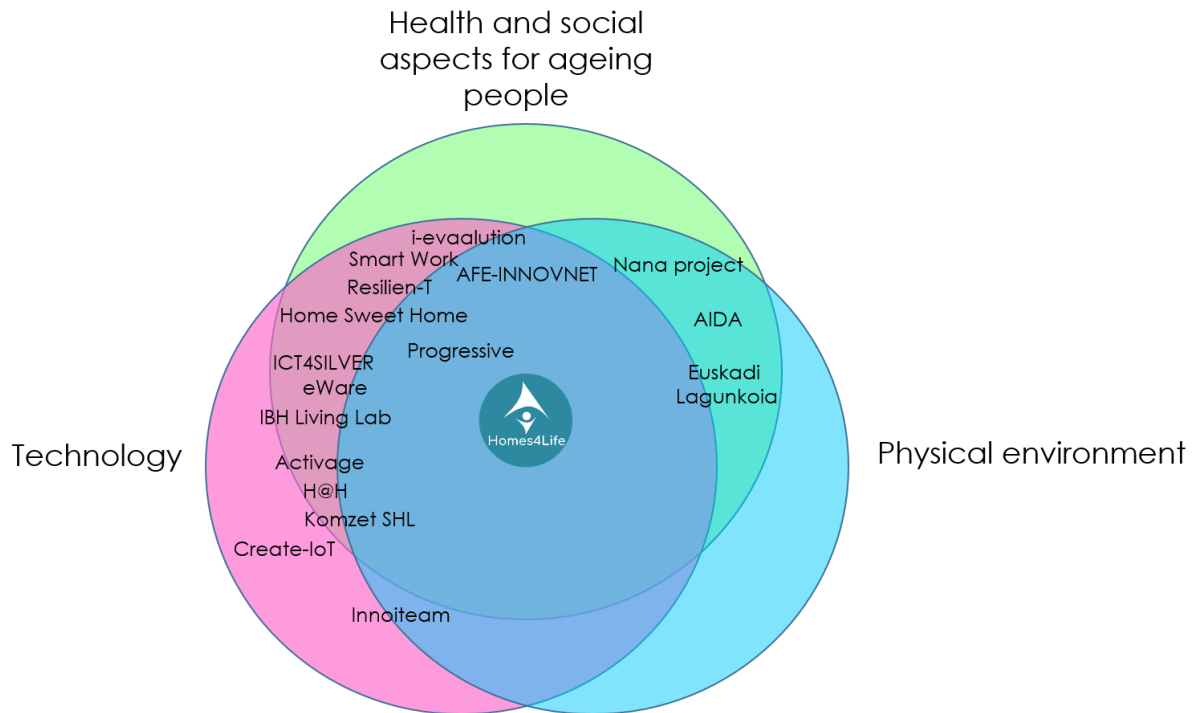


FIGURE 1: VENN DIAGRAM

This classification shows that each project can cover more than one aspect, in particular, the intersection areas. This is in line with the multi-disciplinary research trend currently ongoing at EU and world levels (also guided by the EU Calls for Proposals). There are however gaps in considering all the age-friendly environment aspects. It should, moreover be observed, that the focus of the more research-oriented projects analysed is even narrower. Apart from mainly the AIDA project, all these projects fall into the intersection area covering "Technology for Health and Social Aspects". For this reason, there is a strong attention, from several years, in having standards in this research field. Some projects have already explored the standards to develop ICT solutions, platforms, interoperability, IoT etc. but several of them are partly overlapping.

If we finally relate this analysis to the classification used in the Homes4Life taxonomy and KPI-framework, i.e.

- physical cluster includes: Personal_Safety, Comfort, Accessibility_and_orientation, Health_and_social_care, Smart_readiness.
- outdoor accessibility cluster includes: Home_and_building, Immediate_environment, Neighbourhood_or_village.
- personal cluster includes: Identity_and_emotional_connectivity, Privacy_and_dignity.
- social cluster includes: Social_activity, Employment.
- economic cluster includes: Affordability, Choice.



it emerges that the research-oriented projects cover only part of one of the five clusters (the Physical clusters), with all other clusters and sub-sections thereof considered by Homes4Life to be important for a balanced and inclusive understanding of the age-friendly home environment remaining largely unaddressed.

As a conclusion, the function of Homes4Life, in relation to this R&I analysis, first of all, is to bring to light the extent and importance of the research areas not covered by current research and innovation projects. Secondly, by establishing a working taxonomy and a KPI framework around age-friendly housing, Homes4Life allows building up of a structured understanding of these research areas, which include aspects of the physical environment but also community living, personal and social aspects and all the weaknesses and barriers analysed in this deliverable. Together with the demonstration of its relevance and utility in certification, this structured understanding should function as a potential guidance to potential future new needs to developing, innovation and upscaling in the field of age-friendly housing.



6 References

<p>(EC DG R&I, 2015)</p>	<p>EC DG R&I (2015) European Commissions Directorate-General for Research and Innovation, Guidelines on Open Access to Scientific Publications and Research Data in Horizon 2020, Version 2.0, Brussels</p>
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